RRB Group D Official Paper (Held On: 05 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. Why is the gravitational force considered a weak force in everyday terrestrial interactions, such as between you and a friend sitting nearby?

(a) Because the mass of human objects is much greater than the Earth's mass.
(b) Because the force is only significant when large masses (like planets or celestial bodies) are involved.
(c) Because the distance between the objects is negligibly small.
(d) Because the force is only experienced when the objects are in free fall.

Q2. Which of the following statements is/are correct?

A) The formula unit mass of $CaCl_2$ is 111 u.
B) The formula unit mass is calculated in the same manner as we calculate the molecular mass.
C) The formula unit mass is calculated in a manner that is different to how we calculate the molecular mass.

(a) Only B and C
(b) Only A and B
(c) Only C
(d) Only A

Q3. In a concave mirror, a ray of light directed towards the principal focus after reflection:

(a) Becomes parallel to the principal axis
(b) Diverges away from the axis
(c) Retraces its path
(d) Passes through the center of curvature

Q4. Which of the following statements about oxidation and reduction are correct?

I. A substance is said to be oxidised if it gains oxygen or loses hydrogen.
II. A substance is reduced if it loses oxygen or gains hydrogen.
III. In every redox reaction, both oxidation and reduction occur simultaneously.

(a) I, II, and III
(b) I and III only
(c) II and III only
(d) I and II only

Q5. Which of the following statements about nervous tissue is correct?

(a) Nervous tissue is composed of epithelial cells that form protective layers.
(b) Nervous tissue consists of neurons and is found in the brain, spinal cord and nerves
(c) Nervous tissue is made up of muscle fibres responsible for movement.
(d) Nervous tissue is responsible for voluntary movement and is attached to bones.

Q6. What is the primary function of epithelial tissue?

(a) Support
(b) Control
(c) Protection
(d) Movement

Q7. Which of the following does NOT involve oxidation reaction?

(a) Burning of wood
(b) Electrolysis of water
(c) Dissolution of salt in water
(d) Rusting of iron

Q8. The wavering of objects seen through a turbulent hot air stream is an example of:

(a) small-scale atmospheric refraction
(b) internal reflection in air layers
(c) diffraction in air
(d) dispersion of light

Q9. Select the correct example of a crystalline solid.

(a) Only salt
(b) All salt, sugar and sand
(c) Only sand
(d) Both sugar and salt

Q10. Which of the following products is formed on complete combustion of hydrocarbons?

(a) CO and water
(b) CO_2 and water
(c) Methane and hydrogen
(d) Methane and oxygen

Q11. Which of the following is an example of natural ecosystem?

(a) Hydroponics
(b) Kitchen garden
(c) Forests
(d) Fish aquarium

Q12. What happens to the inter-particle space when a solid melts into a liquid?

(a) It decreases
(b) It remains the same
(c) It increases
(d) It becomes zero

Q13. Which of the following is a T-shaped intra-uterine contraceptive device that offers long-term (multi-year) birth control?

(a) Copper-T
(b) Male condom
(c) Birth control pill
(d) Diaphragm

Q14. Through the phenomenon of biological magnification, which of the following has the highest concentration of pesticide?

(a) Frog
(b) Grass
(c) Snake
(d) Grasshopper

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Q15. Which of the following statements is correct about reproduction in plants?

(a) Spores are produced only during sexual reproduction.
(b) Spores can alone produce new offspring.
(c) Spores need fusion with another spore to produce new offspring.
(d) Gametes can alone produce new offspring.

Q16. What is the minimum time gap needed between the original sound and its echo for us to hear a clear echo?

(a) 1 second
(b) 10 seconds
(c) 0.1 seconds
(d) 0.01 seconds

Q17. If a current 0.2A is flowing in a wire while there is a potential difference 2 V between its ends, what is the resistance of the wire?

(a) 10 Ω
(b) 1 Ω
(c) 0.1 Ω
(d) 4 Ω

Q18. (CH3)3-C-CH3 represents the structural formula of which of the following organic compounds?

(a) methyl butane
(b) 2,2-dimethyl propane
(c) 2,3-dimethyl propane
(d) 3-methyl butane

Q19. A compass needle placed near a current-carrying conductor shows deflection because:

(a) Current produces magnetic field
(b) Current produces electric field
(c) Current produces heat
(d) Current produces sound

Q20. What happens when an unbalanced force acts on an object?

(a) The object moves without any acceleration
(b) The object remains at rest permanently
(c) The object always moves in a circular path
(d) There is a change in the object's speed or direction of motion

Q21. The anion formed by which of the following non-metals reacts with Ca^(2+) ion to form a stable ionic compound?

(a) Oxygen
(b) Nitrogen
(c) Boron
(d) Carbon

Q22. Which of the following statements is true about mass?

(a) Mass depends on the location of the body
(b) Mass is a measure of the force acting on a body
(c) Mass is a measure of inertia of a body
(d) Mass and weight are exactly the same

Q23. Which of the following is the fluid content inside the plasma membrane?

(a) Ribosomes
(b) Nuclear membrane
(c) Cell wall
(d) Cytoplasm

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Q24. Which of the following is a psychological change associated with sexual maturity?

(a) Development of brain
(b) Hair growth on skin
(c) Increased physical activity
(d) Desire of independence and mood swings

Q25. If a constant force of 10 N moves an object 5 m in the direction of the force, find the work done.

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

MATHEMATICS

Q26. Which of the following numbers is divisible by 105?

(a) 4845
(b) 4675
(c) 4525
(d) 4515

Q27. One pipe can fill a tank in 9 minutes while another pipe can empty the completely filled tank in 18 minutes. If both the pipes are opened together when the tank is empty, how many minutes will it take to fill one-half of the tank?

(a) 18
(b) 10
(c) 19
(d) 9

Q28. If 5^(u+v) = 625 and 625^(u-v) = 5, then find the value of u.

(a) 25
(b) 17/8
(c) 125
(d) 15/8

Q29. Ajay and Shanu have a total of Rs. 1,050. If Rs. 350 is taken from Ajay, he will have the same amount as Shanu initially. Find the initial amounts of money that Ajay and Shanu have.

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

Q30. A product was sold for Rs. 980, resulting in a loss of Rs. 150. To earn a profit of Rs. 270 instead, what should be its revised selling price?

(a) Rs. 1,130
(b) Rs. 1,430
(c) Rs. 1,400
(d) Rs. 1,100

Q31. The value of $\sin^2 45° + \cos^2 45°$?

(a) 1/2
(b) √2
(c) 2
(d) 1

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Q32. If 20% of a number is added to 84, then the result is the same number. 80% of the same number is:

(a) 104
(b) 94
(c) 84
(d) 114

Q33. Isha buys a gold ring for her mother. The gold ring costs Rs. 50,000, and two successive discounts of 30% and R% are offered on it, respectively. After receiving the two successive discounts, she paid Rs. 14,000. Find the value of R.

(a) 58
(b) 62
(c) 59
(d) 60

Q34. The sum of the ages of three brothers is 52 years. The oldest brother is 4 years older than the middle brother, and the middle brother is 6 years older than the youngest brother. Find the age of the oldest brother.

(a) 24 years
(b) 18 years
(c) 22 years
(d) 14 years

Q35. The length of one side of a regular hexagonal tile is 6 cm. The tile is divided into 6 equilateral triangles by drawing lines from the center to each vertex. If 3 alternate triangles are painted blue, what is the total area painted blue (rounded to two decimal places)?

(a) 47.27 cm^2
(b) 46.71 cm^2
(c) 45.27 cm^2
(d) 44.77 cm^2

Q36. The price of a washing machine is 25% less than the price of a TV. If the price of the washing machine increases by 66% and the price of the TV decreases by 57%, what will be the percentage change in the total price of 7 washing machines and 5 TVs?

(a) 7% decrease
(b) 8% increases
(c) 6% increases
(d) 1% decrease

Q37. In quadrilateral PQRS, the bisectors of sides angle R and angle S meet at point T (within the quadrilateral) and is angle STR = 36°. If the ratio of angle P and angle Q is 2 : 7, then what is the difference between the measures of angle Q and angle P ?

(a) 39°
(b) 45°
(c) 43°
(d) 40°

Q38. If $a + b = 8$ and $ab = 12$, then find the value of $a^2 + b^2$.

(a) 45
(b) 35
(c) 30
(d) 40

Q39. If the difference of the mode and median of a data is 52, then find the difference of the median and mean.

(a) 28
(b) 24
(c) 22
(d) 26

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Q40. The population of a village increased by 5% in 2023 and is expected to increase again by 6% in 2024. Find the total percentage increase in the population of the village in the two years.

(a) 12.2%
(b) 11.3%
(c) 14.22%
(d) 11.13%

Q41. Two numbers add up to 98. If twice the smaller number minus the bigger number equals 28, find the smaller number.

(a) 36
(b) 56
(c) 42
(d) 48

Q42. The arithmetic mean of the observations 39, 91, 32, 73, 84, 18, 83, 83 and 28 is:

(a) 50
(b) 59
(c) 62
(d) 51

Q43. A sum of money was invested at simple interest at a certain rate for 10 years. Had it been invested at a 6% per annum higher rate, it would have fetched Rs. 5,700 more. Find the principal.

(a) Rs. 9,000
(b) Rs. 9,500
(c) Rs. 8,500
(d) Rs. 10,000

Q44. The sum of three numbers is 2316. If the ratio between the first and second number is 16 : 10 and the ratio between the second and third number is 6 : 18, then find the difference between the first and third number.

(a) 547
(b) 579
(c) 597
(d) 574

Q45. The sides of a triangle are 45 cm, 28 cm and 53 cm. What is its area (in cm2)?

(a) 624
(b) 603
(c) 630
(d) 623

Q46. What will be the average speed of a bike which covers half the distance at 42 km/hr and the remaining half at 84 km/hr?

(a) 56 km/hr
(b) 47 km/hr
(c) 57 km/hr
(d) 63 km/hr

Q47. Which of the following numbers is divisible by 6?

(a) 7993043
(b) 7699504
(c) 7132950
(d) 6348681

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Q48. DMART is offering a 'Buy 30, Get 21 Free' offer on grocery items. What is the net discount percentage offered by DMART? (Correct to two decimal places)

(a) 41.18%
(b) 44.15%
(c) 42.01%
(d) 39.7%

Q49. Nick, Kevin, and Joe can complete a certain task in 10, 47, and 24 days, respectively. All three began working together. Nick left after 2 days, and Kevin left just 5 days before the task was completed. Find the total number of days required to complete the task.

(a) 12.5
(b) 14.4
(c) 18.9
(d) 19.8

Q50. Abhijeet arrives at his office 30 minutes late when he walks at his usual speed of 2/7. How long does it usually take him to travel the distance between his home and office?

(a) 12 minutes
(b) 13 minutes
(c) 15 minutes
(d) 5 minutes

GENERAL INTELLIGENCE & REASONING

Q51. 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) ILM
(b) WZA
(c) TWX
(d) KOO

Q52. A, B, C, D, E, F, and G are seated around a round table, facing the center. B sits second to the right of D. C is an immediate neighbor of A and B. E sits immediate right of G. How many people sit between F and B, when counted from the left of F?

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

Q53. Select the set in which the numbers are related in the same way as the numbers in the following sets.

(Note: Operations must be performed on whole numbers, without breaking the numbers into their component digits. Take 13 for example - operations on 13 such as addition/subtraction/multiplication etc. can be performed on 13. Breaking 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(13, 39, 3)

(15, 75, 5)

(a) (5, 25, 15)
(b) (10, 35, 3)
(c) (64, 8, 4)
(d) (12, 36, 3)

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Q54. In a certain code language, 'soup hat honey' is written as 'vc iw dp' and 'honey wall yak' is written as 'ar hw iw'. How will 'honey' be written in the given language?

(a) iw
(b) dp
(c) vc
(d) ar

Q55. Sahana starts from point A and walks 6 km west. Then she turns left, walks 8 km, then turns left again and walks 2 km. Then she turns left again and walks 4 km. Finally, she turns right, walks 4 km and stops at point P. How far (the shortest distance) and in which direction must she walk to reach point A again?

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

(a) 4 km towards North
(b) 7 km towards North
(c) 6 km towards West
(d) 4 km towards South

Q56. In a certain code language, ‘desk round mom’ is coded as ‘md ei wx’ and ‘mom wheat bell’ is coded as ‘um ac ei’. How will ‘mom’ be coded in the given language?

(a) um
(b) ei
(c) md
(d) wx

Q57. Six cadets, Ram, Shyam, Ravi, John, Noel and Rohan, are standing around a round flag-hoisting pole, facing towards the centre. Noel is the immediate neighbour of Ram and Rohan. John is third to the left of Ram. Ravi and Shyam are sitting next to each other. John is a neighbour of both Shyam and Rohan. Who amongst the following is sitting between Ram and Shyam, when counted from the left of Shyam?

(a) Noel
(b) Rohan
(c) Ravi
(d) Ram

Q58. In a certain code language,

P # Q means 'P is Q's father',

P % Q means 'P is Q's sister',

P @ Q means 'P is Q's wife', and

P & Q means 'P is Q's brother'.

Based on the above, if 'G @ D # B @ K # J', then how is G related to J?

(a) Mother's mother
(b) Father's mother
(c) Husband's sister
(d) Father's sister

Q59. 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) EHJ
(b) DHI
(c) KNP
(d) UXZ

Q60. Look at the number series below and answer the question that follows. Counting should be done from left to right only.

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

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

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How many odd numbers are there that are immediately preceded by an odd number and immediately followed by an even number?

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

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

CMN KUV SCD AKL ?

(a) IDE
(b) STI
(c) ISD
(d) IST

Q62. Seven boxes B, C, D, I, J, K, and L are placed one above the other, but not necessarily in the same order. Only two boxes are placed between J and B. Only K is placed above I. Only two boxes are placed between K and J. C is placed somewhere below L but somewhere above D. How many boxes are placed between C and L?

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

Q63. Juhi starts driving from point A and drives 57 km north. Then she turns right, drives 58 km, turns right again and drives 61 km. Then she turns right again and drives 60 km. Finally, she turns right, drives 4 km and stops at point P. How far (shortest distance) and in which direction must she drive to reach point A again? (Unless specified, all turns are 90 degrees only.)

(a) 4 km to the west
(b) 3 km to the west
(c) 2 km to the east
(d) 1 km to the east

Q64. In a certain way, DI 2 is related to UZ 8. In the same way, MR 4 is related to DI 64. Following the same logic, OT 3 is related to which of the given options?

(a) NW 21
(b) LE 18
(c) FK 27
(d) GK 16

Q65. What will come in place of question mark (?) in the given series?

87 75 63 51 39 ?

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

Q66. This question is based on the five three-digit numbers given below.

(Left) 582 128 563 183 592 (Right)

(Example: 697 - first digit = 6, second digit = 9, and third digit = 7)

Note: All operations are performed from left to right.

What will be the result if the third digit of the largest number is added to the second digit of the smallest number?

(a) 7
(b) 6
(c) 3
(d) 4

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Q67. Each of the digits in the number 2365987 is arranged in descending order from right to left. Calculate the sum of the digits whose position(s) remain(s) unchanged as compared to that in the original number.

(a) 12
(b) 9
(c) 13
(d) 14

Q68. Seven boxes B, C, D, I, J, K, and L are placed one above the other, but not necessarily in the same order. Only I is placed above L. Only three boxes are placed between I and B. Only K is placed below C. D is placed immediately above B. How many boxes are placed between J and K?

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

Q69. A, B, C, R, S, T, and U are seated around a round table, facing the center. A sits third to the left of R. B sits second to the left of C. R is an immediate neighbor of both U and B. T is not an immediate neighbor of A. How many people sit between S and B, when counted from the right of S?

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

Q70. Based on the English alphabetical order, RBUL is related to VXYH in a certain way. Similarly, ZTCD is related to DPGZ. Following the same logic, which of the given options is HLKV related to?

(a) MINQ
(b) LHOR
(c) LIPS
(d) KGPS

Q71. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

7P25 10Q20 ? 16S10 19T5

(a) 16R15
(b) 13R15
(c) 15R13
(d) 14R15

Q72. What will come in place of question mark (?) in the given series?

1 1 2 6 24 120 ?

(a) 720
(b) 160
(c) 520
(d) 300

Q73. Refer to the following series and answer the question (all numbers are single digit numbers only). Counting to be done from left to right only.

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

How many such even digits are there each of which is immediately preceded by an even digit and also immediately followed by an even digit?4105

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

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Q74. If + means −, − means ×, × means ÷ and ÷ means +, then what will come in place of question mark (?) in the following equation?

131 - 7 ÷ 32 + 362 × 2 = ?

(a) 768
(b) 766
(c) 765
(d) 767

Q75. In a certain way, TP 16 is related to LH 8. In the same way, PL 18 is related to HD 9. Following the same logic, LH 12 is related to which of the given options?

(a) LS 6
(b) PW 6
(c) DZ 6
(d) EL 8

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 follows from the statements.

Statement: All ostriches are eagles. No ostrich is a peacock.

Conclusion (I): No eagle is a peacock.

Conclusion (II): Some peacocks are ostriches.

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

Q77. If ‘E’ means ‘+’, ‘F’ means ‘-’, ‘G’ means ‘×’ and ‘H’ means ‘÷’, then what will come in place of question mark ‘?’ in the following equation?

96 H 12 G 2 E 15 F 9 = ?

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

Q78. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

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

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

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

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

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

Statements:

All figs are bananas.

All cups are bananas.

Conclusions:

(I) Some figs are cups.

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(II) All cups are figs.

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

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

1 9 25 ? 81

(a) 49
(b) 36
(c) 30
(d) 64

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Which country was elected as the Chair of the Afro-Asian Rural Development Organization (AARDO) for 2025-27?

(a) India
(b) Ghana
(c) Singapore
(d) Malaysia

Q82. Which Indian state released a draft child protection policy on 1 April 2025 inviting public feedback on implementation across institutions?

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

Q83. Which technology was used to create the latest lab-grown human lung microtissue in 2025?

(a) AI-powered organoid modeling
(b) 3D bioprinting with stem cells
(c) CRISPR editing
(d) Quantum protein folding simulation

Q84. Which of the following states has processed the highest amount of e-waste during 2024-25, as per the Government of India report in July 2025?

(a) Gujarat
(b) Uttar Pradesh
(c) Madhya Pradesh
(d) Kerala

Q85. Which of the following insurance companies has launched the 'SheTARA' health campaign on International Women's Day, 2025?

(a) HDFC ERGO General Insurance
(b) United India Insurance Company
(c) ICICI Lombard General Insurance
(d) Star Health and Allied Insurance

Q86. The Indian Prime Minister has launched a scheme named _____ on 11 October 2025 with a budgetary allocation of Rs. 11,440 crore for the period 2025-26 to 2030-31.

(a) Mission for Aatmanirbharta in Pulses
(b) PM Fasal Bima Yojana
(c) PM Krishi Sinchai Yojana
(d) Mission for Cotton Productivity

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Q87. In March 2025, which country hosted the G20 Foreign Ministers' meeting?

(a) India
(b) Germany
(c) Italy
(d) South Africa

Q88. In July 2025, who inaugurated the 'Mahila Arogya Kaksha' to promote women's health at Shastri Bhawan?

(a) Rajeev Chandrashekhar
(b) Nirmala Sitharaman
(c) Smriti Irani
(d) Arjun Ram Meghwal

Q89. Which Indian cricketer is among those who will receive the Padma Shri in 2025?

(a) K.L. Rahul
(b) Virat Kohli
(c) Ravichandran Ashwin
(d) Rohit Sharma

Q90. The IRIS chip developed by the Indian Institute of Technology (IIT) Madras and ISRO is based on which indigenous microprocessor architecture?

(a) SHAKTI
(b) ARM Cortex
(c) Intel x86
(d) MIPS

Q91. In May 2025, the United Nations Development Programme (UNDP) released the Human Development Index (HDI) 2024 report. What was India's rank on the HDI list?

(a) 143rd
(b) 132nd
(c) 130th
(d) 134th

Q92. Which agency launched Bharatpol in January 2025, to streamline real-time Interpol communication for Indian agencies?

(a) Central Vigilance Commission
(b) Central Bureau of Investigation
(c) Reserve Bank of India
(d) NITI Ayog

Q93. To be held in June 2025, the 2025 World Judo Championships were held at which place?

(a) Budapest, Hungary
(b) Baku, Azerbaijan
(c) Doha, Qatar
(d) Tokyo, Japan

Q94. Which of the following institutions launched WhatsApp Channel for verified financial updates in April 2025?

(a) Indian Bank
(b) State Bank of India
(c) Punjab National Bank
(d) Reserve Bank of India

Q95. What was India's rank in the Climate Change Performance Index (CCPI) 2025?

(a) 11th
(b) 13th
(c) 10th

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(d) 7th

Q96. Who won the Men's Singles title at the 2025 Australian Open?

(a) Novak Djokovic
(b) Carlos Alcaraz
(c) Daniil Medvedev
(d) Jannik Sinner

Q97. The Indian who won the United Nations Sasakawa Award 2025 for Disaster Risk Reduction is popularly known as?

(a) Rain Man of India
(b) Storm Tracker
(c) Cyclone Man of India
(d) Climate Champion

Q98. Which Indian city hosted the first ASEAN-India Cruise Dialogue on 1 July 2025?

(a) Mumbai
(b) Pondicherry
(c) Visakhapatnam
(d) Chennai

Q99. How many years has Narendra Modi completed as the Prime Minister of India as of May 2025?

(a) Eleven
(b) Fifteen
(c) Eight
(d) Ten

Q100. Which Indian gymnast created history by winning the bronze medal at the FIG Apparatus World Cup 2025?

(a) Aruna Reddy
(b) Meghna Reddy
(c) Pranati Nayak
(d) Dipa Karmakar

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) Because the force is only significant when large masses (like planets or celestial bodies) are involved.

The correct answer is Because the force is only significant when large masses (like planets or celestial bodies) are involved..

Key Points

• Gravitational Force: The gravitational force is a universal force of attraction that acts between two masses. However, its magnitude depends on the mass of the objects and the distance between them. For everyday objects, the mass is relatively small,

making the gravitational force weak and often negligible.

• Significance of Large Masses: The gravitational force becomes significant and noticeable only when one or both of the interacting objects have a very large mass, such as planets, stars, or celestial bodies. This is why we experience Earth's gravity prominently but do not feel gravitational forces between small objects like humans or everyday items.

• Gravitational Constant: The gravitational force is governed by Newton's law of universal gravitation, which includes the gravitational constant ($G = 6.674 \times 10^{-11}$ N·m²/kg²). This constant is extremely small, further reducing the force for objects with small masses.

• Negligible Force Between Small Objects: For two small objects, like a person and a nearby friend, the masses involved are too small, and the distance is too insignificant to generate a noticeable gravitational force. Hence, it is considered weak in such cases.

• Earth's Dominance: On Earth, the gravitational force of the planet itself dominates over the gravitational forces between smaller objects. This makes the force between everyday items imperceptible.

Additional Information

• Newton's Law of Universal Gravitation:

• It states that every particle of matter in the universe attracts every other particle with a force directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.

• Mathematical formula: $F = G \times (m1 \times m2) / r^2$, where F is the force, G is the gravitational constant, m1 and m2 are the masses, and r is the distance.

• Gravitational Force in Everyday Life:

• Earth's gravity pulls objects toward its center, causing objects to have weight.

• Gravitational forces between small objects, such as two humans, are exceedingly small and cannot be felt directly.

• Gravitational Force in Space:

• In space, gravitational forces are responsible for the orbits of planets, moons, and artificial satellites.

• The large mass of celestial bodies like the Sun and Earth makes their gravitational pull significant, governing the dynamics of the solar system.

• Comparison to Other Forces:

• Gravitational force is much weaker compared to other fundamental forces, such as electromagnetic force or nuclear forces.

• For instance, the electromagnetic forces between charged particles are vastly stronger than the gravitational forces between the same particles.

Important Points

• Option Analysis:

• Option 1: Incorrect. The mass of human objects is much smaller compared to the Earth's mass, not greater.

• Option 2: Correct. Gravitational force is only significant when large masses, such as planets or celestial bodies, are involved.

• Option 3: Incorrect. The distance between objects does influence gravitational force, but small distances alone do not make the force significant for small masses.

• Option 4: Incorrect. Gravitational force exists regardless of free fall, as long as there is mass and distance.

• Applications of Gravitational Force:

• Used in calculating satellite orbits and space exploration missions.

• Plays a key role in astrophysics and understanding the structure of the universe.

Q2. Answer: (b) Only A and B

The correct answer is Only A and B.

Key Points

• Statement A: The formula unit mass of $CaCl_2$ is 111 u.

The formula unit mass is calculated by summing up the atomic masses of all atoms in the chemical formula.

For $CaCl_2$:

• Atomic mass of Calcium (Ca) = 40 u.

• Atomic mass of Chlorine (Cl) = 35.5 u. Since there are 2 chlorine atoms, their total mass = 2 × 35.5 = 71 u.

Thus, formula unit mass of $CaCl_2$ = 40 + 71 = 111 u. Hence, statement A is correct.

• Statement B: The formula unit mass is calculated in the same manner as we calculate the molecular mass.

The formula unit mass refers to the sum of the atomic masses of ions in an ionic compound. Similarly, molecular mass is the sum of the atomic masses of atoms in a molecule. Both are calculated in the same way, but their application differs:

• Formula unit mass is used for ionic compounds like $CaCl_2$.

• Molecular mass is used for covalent compounds like H_2O.

Hence, statement B is correct.

• Statement C: The formula unit mass is calculated in a manner that is different to how we calculate the molecular mass.

As explained above, the method of calculation for formula unit mass and molecular mass is the same, although they apply to different types of compounds. Hence, statement C is incorrect.

Additional Information

• Formula Unit Mass:

• It is the sum of the atomic masses of all the atoms present in the formula unit of an ionic compound.

• It is typically used for ionic compounds such as NaCl, $CaCl_2$, etc.

• Example: For NaCl, the formula unit mass is calculated as:

• Atomic mass of Na = 23 u.

• Atomic mass of Cl = 35.5 u.

• Formula unit mass = 23 + 35.5 = 58.5 u.

• Molecular Mass:

• It is the sum of the atomic masses of all the atoms in a molecule.

• It is applicable to covalent compounds such as H_2O, CO_2, etc.

• Example: For H_2O, the molecular mass is calculated as:

• Atomic mass of H = 1 u. Since there are 2 hydrogen atoms, their total mass = 2 × 1 = 2 u.

• Atomic mass of O = 16 u.

• Molecular mass = 2 + 16 = 18 u.

• Difference Between Formula Unit Mass and Molecular Mass:

• Formula unit mass is used for ionic compounds, while molecular mass is used for covalent compounds.

• Both are calculated in the same way, but they apply to different types of chemical substances.

• Importance of Formula Unit Mass:

• It helps in stoichiometric calculations for ionic compounds.

• It provides a way to compare the masses of different ionic compounds.

Important Points

• Atomic Mass: It is the mass of an atom expressed in atomic mass units (u). For example, the atomic mass of hydrogen is 1 u, and that of oxygen is 16 u.

• Ionic Compounds: These are compounds formed by the transfer of electrons, resulting in the formation of positive and negative ions. Examples include NaCl, $CaCl_2$, and MgO.

• Covalent Compounds: These are compounds formed by the sharing of electrons between atoms. Examples include H_2O, CO_2, and CH_4.

• Applications: Both formula unit mass and molecular mass are crucial for understanding chemical reactions, stoichiometry, and determining the molar mass of substances.

Q3. Answer: (a) Becomes parallel to the principal axis

The correct answer is Becomes parallel to the principal axis.

Key Points

• Concave Mirror Properties: A concave mirror is a spherical mirror that curves inward. It reflects light inward to a focal point, and its behavior depends on the position of the object relative to the mirror.

• Principal Focus: The principal focus of a concave mirror is the point where parallel rays of light converge after reflection. This focal point is located on the principal axis.

• Ray Directed Towards Principal Focus: When a ray of light is directed towards the principal focus of a concave mirror, after reflection, it emerges parallel to the principal axis. This occurs because of the geometric relationship between the focus, center of curvature, and the mirror's surface. Hence, the correct answer is "Becomes parallel to the principal axis."

• Reflection Laws: The behavior of light in concave mirrors follows the Laws of Reflection, where the angle of incidence equals the angle of reflection. The direction of reflected rays depends on the curvature and the position of the incident ray.

• Correct Explanation for the Option: The ray directed towards the principal focus becomes parallel to the principal axis after reflection, as this is a characteristic of concave mirrors used in imaging and optical applications.

Additional Information

• Concave Mirrors Usage:

• Used in telescopes to gather and focus light from distant celestial objects.

• Applied in shaving mirrors for magnification due to their ability to form enlarged virtual images.

• Used in headlamps and searchlights to produce parallel beams of light.

• Terminology:

• Principal Axis: The straight line passing through the center of curvature and the pole of the mirror.
• Focal Point: The point where parallel rays converge (concave) or appear to diverge (convex).
• Center of Curvature: The center of the sphere from which the mirror is a section.
• Pole: The center of the mirror's reflective surface.
• Characteristics of Reflection in Concave Mirrors:
• Real and Inverted Images: When the object is beyond the focal point, concave mirrors produce real and inverted images.
• Virtual and Enlarged Images: When the object is between the focal point and the mirror, virtual and enlarged images are formed.
• Parallel Rays: Rays parallel to the principal axis converge at the focal point after reflection.
• Ray Through Center of Curvature: A ray passing through the center of curvature retraces its path after reflection.
• Applications in Daily Life:
• Dental mirrors for viewing enlarged images of teeth.
• Solar cookers to focus sunlight at a specific point for heating.
• Microscopes and optical devices for magnification.

Q4. Answer: (a) I, II, and III

The correct answer is I, II, and III.

Key Points

• Statement I: A substance is said to be oxidised if it gains oxygen or loses hydrogen.
• Oxidation is a chemical process where a substance combines with oxygen or loses hydrogen.
• For example, in the reaction: $2H_2 + O_2 \rightarrow 2H_2O$, hydrogen is oxidised as it combines with oxygen.
• Hence, Statement I is correct.
• Statement II: A substance is reduced if it loses oxygen or gains hydrogen.
• Reduction is a chemical process where a substance loses oxygen or gains hydrogen.
• For example, in the reaction: $CuO + H_2 \rightarrow Cu + H_2O$, copper oxide is reduced as it loses oxygen.
• Hence, Statement II is correct.
• Statement III: In every redox reaction, both oxidation and reduction occur simultaneously.
• Redox reactions involve the simultaneous occurrence of oxidation and reduction processes.
• For example, in the reaction: $Zn + Cu^{(2+)} \rightarrow Zn^{(2+)} + Cu$, zinc is oxidised (loses electrons) while copper ions are reduced (gain electrons).
• Hence, Statement III is correct.

Additional Information

• Redox Reactions:
• Redox is a shorthand term for reduction-oxidation reactions.
• In these reactions, oxidation refers to the loss of electrons, while reduction refers to the gain of electrons.
• Redox reactions are essential in processes such as metabolism, combustion, and corrosion.
• Oxidising Agent and Reducing Agent:
• An oxidising agent is a substance that facilitates oxidation by accepting electrons (e.g., oxygen, halogens).
• A reducing agent is a substance that facilitates reduction by donating electrons (e.g., hydrogen, metals).
• Applications of Redox Reactions:
• Used in electrochemical cells (e.g., batteries).
• Important in industrial processes like metal extraction and bleaching.
• Essential in biological processes such as respiration and photosynthesis.
• Examples of Redox Reactions:
• Rusting of Iron: Iron reacts with oxygen and water to form rust (oxidation).
• Photosynthesis: Plants reduce carbon dioxide into glucose while oxidising water into oxygen.

Important Points

• Key Concept: Oxidation and reduction always occur together; one substance loses electrons (oxidation) while another gains electrons (reduction).
• Electron Transfer: The movement of electrons is the fundamental principle behind redox reactions.
• Applications: Redox reactions are widely used in industries (e.g., electroplating, energy production) and biological systems (e.g., cellular respiration).

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Q5. Answer: (b) Nervous tissue consists of neurons and is found in the brain, spinal cord and nerves

The correct answer is Nervous tissue consists of neurons and is found in the brain, spinal cord, and nerves.

Key Points

• Nervous tissue is primarily made up of specialized cells called neurons and glial cells. Neurons are responsible for transmitting nerve impulses, while glial cells support and protect neurons.

• It is found in the brain, spinal cord, and peripheral nerves, forming the structural and functional framework of the nervous system.

• Neurons are characterized by three main parts: the cell body, dendrites, and axon. These components work together to receive and transmit signals throughout the body.

• The primary function of nervous tissue is to coordinate and control bodily functions. It processes sensory input, sends motor output, and facilitates communication between different body parts.

• Unlike muscle or epithelial tissues, nervous tissue does not participate in movement or form protective layers. Its primary role is signal transmission and integration.

Additional Information

• Statement 1: Nervous tissue is not composed of epithelial cells. Epithelial cells form protective barriers on surfaces, while nervous tissue is specialized for signal transmission. Hence, this statement is incorrect.

• Statement 2: Nervous tissue consists of neurons and glial cells and is found in the brain, spinal cord, and peripheral nerves. This is the correct description of nervous tissue. Hence, this statement is correct.

• Statement 3: Nervous tissue is not made up of muscle fibers. Muscle fibers are part of muscle tissue and are responsible for movement, not signal transmission. Hence, this statement is incorrect.

• Statement 4: Nervous tissue is not responsible for voluntary movement, which is a function of skeletal muscle tissue. Nervous tissue controls and regulates bodily functions by transmitting signals. Hence, this statement is incorrect.

• Functions of Nervous Tissue:

• Processes and interprets sensory input from the environment.

• Generates motor output to muscles and glands.

• Maintains homeostasis by regulating various physiological processes.

• Facilitates complex functions like memory, learning, and emotions.

Important Points

• Types of Nervous Tissue:

• White matter: Composed of myelinated axons, primarily responsible for signal transmission.

• Gray matter: Composed of neuronal cell bodies, dendrites, and unmyelinated axons, primarily involved in processing information.

• Types of Neurons:

• Sensory neurons: Transmit sensory information from receptors to the central nervous system (CNS).

• Motor neurons: Transmit signals from the CNS to muscles or glands.

• Interneurons: Facilitate communication between sensory and motor neurons within the CNS.

• Glial Cells:

• Astrocytes: Provide structural and metabolic support to neurons.

• Microglia: Act as immune cells within the CNS, protecting against pathogens.

• Oligodendrocytes and Schwann cells: Form myelin sheaths around axons in the CNS and PNS, respectively.

• Interesting Fact: The human brain has approximately 86 billion neurons, making it one of the most complex biological systems known.

• Clinical Relevance: Damage to nervous tissue can lead to conditions like paralysis, multiple sclerosis, and Alzheimer's disease.

Q6. Answer: (c) Protection

The correct answer is Protection.

Key Points

• Epithelial tissue is one of the four basic types of tissues in the human body, alongside connective, muscular, and nervous tissues.

• The primary function of epithelial tissue is protection. It serves as a barrier against physical, chemical, and biological harm, safeguarding the underlying structures of the body.

• It forms the outer layer of the skin (epidermis) and lines internal organs, such as the gastrointestinal tract, respiratory tract, and blood vessels, providing a protective shield against external factors.

• In addition to protection, epithelial tissue performs other functions such as absorption, secretion, filtration, and sensory reception, depending on its location and structure.

• The specialized structure of epithelial tissue, including its tightly packed cells and minimal intercellular space, enhances its

protective role by preventing the entry of pathogens and harmful substances.

Additional Information

• Types of Epithelial Tissue:

• Simple Epithelium: Single layer of cells, specialized for absorption, secretion, and filtration. Example: Simple squamous epithelium in lungs for gas exchange.

• Stratified Epithelium: Multiple layers of cells, specialized for protection. Example: Stratified squamous epithelium in skin resists abrasion.

• Pseudostratified Epithelium: Appears layered but is a single layer with nuclei at varying heights. Example: Found in the respiratory tract, facilitating movement of mucus.

• Transitional Epithelium: Specialized for stretching and recoiling. Example: Found in the urinary bladder.

• Functions of Epithelial Tissue:

• Protection: Shields underlying tissues from mechanical injury, pathogens, and dehydration.

• Absorption: Found in the intestines for nutrient uptake.

• Secretion: Forms glands that produce enzymes, hormones, and other substances.

• Excretion: Helps in the removal of waste products. Example: Sweat glands.

• Sensory Reception: Contains sensory nerve endings for detecting stimuli. Example: Taste buds on the tongue.

• Characteristics of Epithelial Tissue:

• Cellularity: Composed of closely packed cells with minimal extracellular matrix.

• Polarity: Has an apical surface (facing free space) and a basal surface (attached to the basement membrane).

• Avascular: Lacks blood vessels; nutrients are supplied through diffusion from underlying connective tissue.

• Regeneration: High regenerative capacity to replace damaged or lost cells.

• Examples:

• Skin: Protects against environmental damage and prevents water loss.

• Stomach lining: Protects against acid and enzymes during digestion.

• Respiratory tract: Protects against dust and microbes using cilia and mucus.

Important Points

• Other Tissue Types and Their Primary Functions:

• Connective Tissue: Provides support and structure to the body. Example: Bone, cartilage, and blood.

• Muscular Tissue: Facilitates movement through contraction. Example: Skeletal, cardiac, and smooth muscles.

• Nervous Tissue: Transmits signals for communication and coordination. Example: Neurons and glial cells.

Q7. Answer: (c) Dissolution of salt in water

The correct answer is Dissolution of salt in water.

Key Points

• Oxidation reactions involve the loss of electrons from an element or compound, often accompanied by the gain of oxygen or loss of hydrogen.

• Burning of wood: This is a combustion process where wood reacts with oxygen to produce carbon dioxide, water, and energy. It is an oxidation reaction. Hence, this involves oxidation.

• Electrolysis of water: During this process, water is decomposed into oxygen and hydrogen gases. The oxygen at the anode undergoes oxidation. Hence, this involves oxidation.

• Dissolution of salt in water: When common salt (NaCl) dissolves in water, it dissociates into its constituent ions (Na^+ and Cl^-). This is a physical change and does not involve any oxidation or reduction. Hence, this does NOT involve oxidation.

• Rusting of iron: Rusting is an electrochemical process where iron reacts with oxygen and moisture, forming iron oxides (Fe2O3). This is an oxidation reaction. Hence, this involves oxidation.

Additional Information

• Oxidation:

• Oxidation is defined as the loss of electrons or the increase in oxidation state of an element in a reaction.

• It often involves the addition of oxygen or removal of hydrogen.

• Examples: Combustion, rusting, and many chemical reactions like the oxidation of glucose in the body.

• Reduction:

• Reduction is the gain of electrons or the decrease in oxidation state of an element in a reaction.

• It often involves the addition of hydrogen or removal of oxygen.

• Oxidation and reduction always occur together in a redox reaction.

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• Examples of Oxidation Reactions:

• Combustion reactions like burning of fuels (e.g., methane with oxygen).

• Corrosion processes like rusting of iron.

• Metabolic reactions such as oxidation of glucose during respiration.

• Dissolution of substances:

• The dissolution of substances like salt in water is a physical process where the ionic bonds of salt break, and ions get solvated by water molecules.

• No chemical change or electron transfer takes place during dissolution.

Important Points

• Physical vs Chemical Processes:

• Physical processes (e.g., dissolution, phase changes) do not alter the chemical composition of substances.

• Chemical processes (e.g., oxidation, combustion) involve changes in chemical bonds and electron transfer.

• Redox Reaction: Redox reactions are a combination of oxidation and reduction processes. They are essential in many natural and industrial processes.

• Applications of Oxidation:

• In energy production, such as combustion in engines and oxidation of glucose in cells.

• In industrial processes, such as metal extraction and electroplating.

Q8. Answer: (a) small-scale atmospheric refraction

The correct answer is small-scale atmospheric refraction.

Key Points

• Small-scale atmospheric refraction occurs when light rays are bent due to the varying refractive index of air caused by temperature and density differences. This phenomenon is responsible for the wavering or shimmering appearance of objects seen through a turbulent hot air stream.

• The refractive index of air changes with temperature gradients. Hot air is less dense and has a different refractive index compared to cooler air, creating localized variations in light refraction.

• In a hot air stream, such as above a flame or on a hot road, the random movement of air layers creates turbulence, leading to constantly changing refraction paths of light, resulting in the perception of wavering objects.

• This effect is commonly observed in hot weather conditions, such as the shimmering appearance of distant objects over a hot road or desert.

• The phenomenon is purely optical and is not related to internal reflection, diffraction, or dispersion of light. Hence, the correct answer is small-scale atmospheric refraction.

Additional Information

• Internal reflection in air layers:

• Internal reflection refers to the bouncing back of light within a medium, such as in optical fibers or water droplets in a rainbow. It is not responsible for the wavering effect seen through a hot air stream.

• Diffraction in air:

• Diffraction occurs when light bends around obstacles or through small apertures. While diffraction can cause certain visual effects, it does not explain the shimmering or wavering of objects caused by hot air turbulence.

• Dispersion of light:

• Dispersion involves the splitting of light into its component colors, as seen in a prism or a rainbow. This phenomenon is unrelated to the wavering effect caused by temperature-induced refraction in air.

• Atmospheric refraction in general:

• Atmospheric refraction is a broader concept that explains phenomena like the apparent bending of sunlight at sunrise and sunset, the twinkling of stars, and the shimmering of distant objects. Small-scale atmospheric refraction is a localized and specific example of this larger principle.

Important Points

• Everyday examples of small-scale atmospheric refraction:

• The wavering of objects seen above a candle flame or a stove is a common example of small-scale atmospheric refraction.

• The shimmering or mirage effect observed on hot roads, especially during summer, is another example where temperature gradients create variations in the refractive index of air.

• Relation to turbulence:

• Turbulent air currents caused by uneven heating amplify the effect of small-scale atmospheric refraction, leading to noticeable wavering or shimmering of objects.

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Q9. Answer: (d) Both sugar and salt

The correct answer is Both sugar and salt.

Key Points

• Crystalline solids are substances in which particles are arranged in a highly ordered structure, forming a repeating pattern called a crystal lattice.

• Sugar: Sugar is a crystalline solid because its molecules form a repeating lattice structure when solidified. It is used in daily life for consumption and sweetening purposes.

• Salt: Table salt (sodium chloride) is also a crystalline solid as its ions arrange themselves in a cubic lattice structure. Salt is widely used for seasoning food and preserving items.

• Sand: Sand is typically composed of silica (SiO2), but it is amorphous rather than crystalline due to the lack of a long-range order in its structure. Therefore, sand is not considered a crystalline solid.

• Hence, the correct answer is Both sugar and salt, as both substances exhibit the properties of crystalline solids.

Additional Information

• Crystalline Solids:

• These solids have a definite geometric shape and show anisotropy, meaning their properties differ based on the direction of measurement.

• Their melting points are sharp, and they exhibit high levels of orderliness in particle arrangement.

• Examples include sugar, salt, diamond, quartz, and metals like copper and iron.

• Amorphous Solids:

• Unlike crystalline solids, amorphous solids lack a regular arrangement of particles and do not form a clear lattice structure.

• They are isotropic, meaning their properties are uniform in all directions.

• They do not have sharp melting points and soften over a range of temperatures.

• Examples include glass, rubber, plastics, and most types of sand.

• Crystal Lattice:

• A crystal lattice is a 3D arrangement of atoms, ions, or molecules in a crystalline solid.

• The unit cell is the smallest repeating unit of the lattice, which determines the crystal's overall structure.

• Common lattice types include cubic, hexagonal, tetragonal, and orthorhombic structures.

• Applications of Crystalline Solids:

• Salt: Used in food preservation, seasoning, and industrial processes such as chlorine production.

• Sugar: Widely used in food preparation, fermentation, and as a sweetener in beverages.

• Quartz: Used in watches, electronics, and optical equipment due to its piezoelectric properties.

• Metals: Essential for construction, electronics, and transportation industries.

Important Points

• Salt's Crystalline Nature: Sodium chloride forms a cubic lattice structure due to ionic bonding between Na^+ and Cl^- ions.

• Sugar's Crystalline Nature: Sugar molecules form a monoclinic lattice structure due to hydrogen bonding between molecules.

• Sand's Amorphous Nature: Silica in sand lacks long-range order, making it an amorphous solid rather than crystalline.

• Distinction Between Crystalline and Amorphous Solids: Crystalline solids exhibit order and sharp melting points, while amorphous solids lack order and melt over a temperature range.

Q10. Answer: (b) CO2 and water

The correct answer is CO2 and water.

Key Points

• On the complete combustion of hydrocarbons, the primary products formed are carbon dioxide (CO2) and water (H2O). This process occurs when there is a sufficient supply of oxygen.

• Hydrocarbons consist of carbon (C) and hydrogen (H). During complete combustion, carbon reacts with oxygen to form carbon dioxide (CO2), and hydrogen reacts with oxygen to form water (H2O).

• The general equation for the complete combustion of a hydrocarbon is: $C_xH_y + (x + y/4)O2 \rightarrow xCO2 + (y/2)H2O$.

• Complete combustion releases a significant amount of energy in the form of heat and is often used in energy generation processes, such as in internal combustion engines and power plants.

• If the supply of oxygen is insufficient, incomplete combustion occurs, leading to the formation of carbon monoxide (CO) or even soot (C) along with water.

Additional Information

• Combustion Process:

• Combustion is a chemical reaction that occurs between a fuel (such as hydrocarbons) and an oxidant (such as oxygen) to

produce heat and light.

• It is classified into two types:

• Complete Combustion: Occurs with excess oxygen, producing carbon dioxide (CO_2) and water (H_2O).

• Incomplete Combustion: Occurs with limited oxygen, producing carbon monoxide (CO), soot (C), or other partially oxidized compounds.

• Examples of hydrocarbons include methane (CH_4), propane (C_3H_8), and butane (C_4H_{10}).

• Energy Release:

• Combustion of hydrocarbons is an exothermic reaction, meaning it releases energy in the form of heat.

• This energy is utilized in various applications, such as powering vehicles, generating electricity, and heating systems.

• Environmental Impact:

• Complete combustion produces less harmful emissions compared to incomplete combustion.

• However, the release of CO_2 contributes to the greenhouse effect and global warming.

• Efforts are being made to reduce the combustion of fossil fuels and shift towards renewable energy sources.

• Characteristics of Combustion Products:

• Carbon Dioxide (CO_2): A colorless, odorless gas that is a major contributor to the greenhouse effect.

• Water (H_2O): Released in vapor form during combustion and condenses as liquid water under cooler conditions.

• Carbon Monoxide (CO): A toxic, colorless, and odorless gas produced during incomplete combustion.

• Soot (C): Solid carbon particles that result from incomplete combustion, contributing to air pollution.

• Applications:

• Complete combustion is widely used in engines, industrial furnaces, and power plants for efficient energy generation.

• It is also crucial in reducing pollutants and ensuring better fuel efficiency.

Q11. Answer: (c) Forests

The correct answer is Forests.

Key Points

• Forests are an example of a natural ecosystem as they occur naturally without human intervention and maintain a balance of flora, fauna, and other abiotic factors.

• A natural ecosystem is a self-sustaining ecological unit where all living organisms (plants, animals, microorganisms) interact with non-living components (soil, water, air, sunlight) in a balanced manner.

• Forests support a diverse range of species, including trees, shrubs, animals, insects, fungi, and microorganisms, making them biodiversity hotspots.

• These ecosystems play a crucial role in carbon sequestration, maintaining climatic conditions, and regulating the water cycle, making them vital for environmental stability.

• Other options like hydroponics, kitchen gardens, and fish aquariums are man-made ecosystems, as they require human effort and intervention to sustain life forms.

Additional Information

• Hydroponics:

• Hydroponics is a man-made farming technique where plants are grown without soil, using nutrient-rich water solutions.

• It requires controlled environmental conditions and human intervention for proper functioning.

• This technique is often used in areas with poor soil quality or urban spaces.

• Kitchen Garden:

• A kitchen garden is a small-scale, man-made ecosystem where vegetables, fruits, and herbs are grown in or around homes.

• It is a sustainable practice but is dependent on human care and inputs like water, fertilizers, and pruning.

• Fish Aquarium:

• A fish aquarium is an artificial ecosystem designed to house aquatic life, requiring human intervention to maintain water quality, oxygen levels, and food supply.

• It lacks the self-sustaining mechanism found in natural ecosystems like rivers or lakes.

• Forests:

• Forests are naturally occurring ecosystems that do not require human intervention for their existence and sustainability.

• They provide numerous ecosystem services, such as oxygen production, carbon storage, and habitat for wildlife.

• Examples include tropical rainforests, temperate forests, and boreal forests.

Important Points

• Natural Ecosystem:

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• Examples include forests, oceans, rivers, grasslands, and deserts.

• They are self-regulating and maintain ecological balance.

• Man-Made Ecosystem:

• Examples include agricultural fields, urban parks, aquariums, and hydroponic systems.

• They require external inputs like fertilizers, energy, and human care to sustain life forms.

Q12. Answer: (c) It increases

The correct answer is It increases.

Key Points

• When a solid melts into a liquid, its particles gain energy and move more freely. This results in an increase in inter-particle space, as the rigid structure of the solid is broken.

• In a solid, particles are tightly packed in a fixed, rigid lattice structure. This arrangement has minimal inter-particle space, making solids incompressible and dense.

• When heat is applied to a solid, its particles absorb energy. This energy increases the vibrational motion of the particles, weakening the intermolecular forces that hold them together in a fixed position.

• As the intermolecular forces weaken, the particles begin to move more freely, transitioning the material from a solid to a liquid state. This increased movement causes the inter-particle space to expand.

• The melting point of a substance is the temperature at which this transition occurs, and it is a physical property unique to each substance.

Additional Information

• Inter-particle Space in Different States of Matter:

• Solids: The particles are closely packed with negligible inter-particle space, making them rigid and incompressible.

• Liquids: The particles have more freedom to move, resulting in increased inter-particle space compared to solids. Liquids are not rigid but have a definite volume.

• Gases: The particles are far apart with maximum inter-particle space, allowing gases to expand and fill their containers.

• Heat Energy and Phase Changes:

• Adding heat to a solid increases the kinetic energy of its particles. Once the energy surpasses the intermolecular forces, the solid transitions to a liquid.

• This process is known as melting, and the energy required to change a solid to a liquid without temperature change is called latent heat of fusion.

• Characteristics of Melting:

• During melting, the temperature remains constant until the entire solid has turned into a liquid.

• The density of the substance typically decreases as it transitions from solid to liquid due to the increase in inter-particle space.

• Examples of Melting:

• Ice to Water: When ice is heated, it absorbs heat energy, increasing the movement of water molecules and causing the solid structure to break apart.

• Metals: Metals like iron or gold melt at high temperatures, where their rigid lattice structures break down into a liquid form.

Important Points

• Option Analysis:

• Option 1: "It decreases" – This is incorrect. The inter-particle space does not decrease during melting; instead, it increases.

• Option 2: "It remains the same" – This is incorrect. The inter-particle space changes during melting as the rigid structure of the solid breaks down.

• Option 3: "It increases" – This is correct. When a solid melts, the inter-particle space expands due to increased particle movement.

• Option 4: "It becomes zero" – This is incorrect. Inter-particle space cannot become zero in a liquid state.

• Applications:

• Understanding melting is crucial in industries like metallurgy, food processing, and materials science.

• It helps in designing processes like casting, molding, and the production of alloys.

Q13. Answer: (a) Copper-T

The correct answer is Copper-T.

Key Points

• Copper-T is a T-shaped intrauterine contraceptive device (IUCD) used for long-term birth control. It is inserted into the uterus to prevent pregnancy and can remain effective for up to 10-12 years, depending on the model.

• This device functions by releasing copper ions, which are toxic to sperm, thereby reducing their mobility and viability. This prevents fertilization of the egg.

• It is one of the most effective contraceptive methods, with a success rate of over 99%, making it a reliable option for long-term contraception.

• Copper-T does not rely on hormones for its functionality, making it suitable for women who cannot or prefer not to use hormonal contraceptives. It also does not interfere with lactation, making it a viable option for breastfeeding women.

• The device is inserted by a trained healthcare professional and requires minimal maintenance. However, regular check-ups are advised to ensure it remains in place and effective.

Additional Information

• Male Condom:

• The male condom is a barrier contraceptive method. It is a thin sheath typically made of latex or polyurethane, designed to cover the penis during intercourse.

• It provides dual protection by preventing pregnancy and reducing the risk of sexually transmitted infections (STIs), including HIV.

• It is a single-use contraceptive and is widely available without a prescription.

• Birth Control Pills:

• Birth control pills, also known as oral contraceptives, are hormonal pills containing synthetic forms of estrogen and/or progesterone.

• These pills prevent ovulation and thicken cervical mucus to block sperm entry.

• They must be taken daily at the same time for maximum effectiveness and offer no protection against STIs.

• Diaphragm:

• The diaphragm is a dome-shaped barrier contraceptive device made of silicone or latex. It is inserted into the vagina to cover the cervix and prevent sperm from entering the uterus.

• It is used with spermicide for enhanced effectiveness and must be placed before intercourse and left in place for at least six hours afterward.

• It provides no protection against STIs and must be fitted by a healthcare provider for proper sizing.

• Advantages of Copper-T:

• It provides long-term contraception without requiring daily or periodic attention.

• It does not interfere with sexual activity, making it convenient for users.

• It is cost-effective over time compared to other contraceptive methods.

• Fertility can return quickly after removal of the device.

Q14. Answer: (c) Snake

The correct answer is Snake.

Key Points

• Biological Magnification, also known as Biomagnification, refers to the increase in the concentration of toxic substances, such as pesticides, as they move up the food chain.

• In a food chain, primary producers like grass have the lowest concentration of toxic substances, as they directly absorb them from the environment.

• The concentration of these toxins increases as they move to higher trophic levels, such as herbivores (like grasshoppers) and then to carnivores (like frogs and snakes).

• Snakes, being at the top of the food chain in this context, accumulate the highest concentration of pesticides and toxins due to their position as secondary or tertiary consumers.

• This is because toxic substances are not metabolized or excreted effectively, leading to their accumulation in the body tissues of organisms at higher trophic levels.

Additional Information

• Grass:

• Grass is a primary producer and occupies the first trophic level in the food chain.

• It absorbs nutrients, along with pesticides or pollutants, from the soil or water.

• The concentration of toxins in grass is minimal compared to higher trophic levels.

• Grasshopper:

• Grasshoppers are primary consumers that feed on grass and other plants.

• They accumulate toxins present in grass, but the concentration is still lower compared to higher levels in the food chain.

• Frog:

• Frogs are secondary consumers that primarily feed on insects like grasshoppers.

• They accumulate more toxins due to consuming multiple contaminated insects.
• Snake:
• Snakes are tertiary consumers, feeding on frogs and other organisms in the food chain.
• As a result, they exhibit the highest level of toxin concentration due to the process of biomagnification.
• Impact of Biomagnification:
• It can cause severe health issues in organisms, such as reproductive failure, developmental problems, and even death.
• Top predators, including humans, are most affected due to their position in the food chain.

Important Points

• DDT and Other Pesticides:
• One of the most common pollutants involved in biomagnification is DDT, a pesticide widely used in agriculture.
• DDT persists in the environment for a long time and is absorbed by plants and aquatic organisms.
• Food Chain Dynamics:
• Biomagnification highlights the importance of maintaining a clean and toxin-free environment.
• Contamination at the base of the food chain (like grass) has cascading effects on all higher trophic levels.
• Conservation Efforts:
• Efforts to reduce the use of persistent organic pollutants (POPs) like DDT have been initiated globally under agreements such as the Stockholm Convention.
• Promoting sustainable agriculture and reducing the use of harmful chemicals can help mitigate biomagnification.

Q15. Answer: (b) Spores can alone produce new offspring.

The correct answer is option 2.

Key Points

• Spores are produced both in sexual and asexual reproduction. Spores are reproductive units that can be formed through mitotic or meiotic division, depending on the mode of reproduction. They are not restricted to sexual reproduction. Hence, statement 1 is incorrect.
• Spores can independently grow into a new organism under favorable conditions. They do not require the fusion of another spore to develop into an offspring. Hence, statement 2 is correct.
• Spores do not need fusion with another spore to reproduce. Unlike gametes that require fusion (fertilization), spores are capable of germinating independently. Hence, statement 3 is incorrect.
• Gametes cannot produce offspring on their own. Gametes require fusion with another gamete (male and female gametes) to form a zygote, which then develops into a new organism. Hence, statement 4 is incorrect.
• Spores are a critical component of asexual reproduction in certain plants, fungi, and microorganisms, allowing them to reproduce effectively in a variety of environmental conditions.

Additional Information

• Spores:
• Spores are unicellular or multicellular structures used for reproduction and dispersal in plants, fungi, and some bacteria.
• They are typically haploid and are produced by meiosis in the sporangium of a diploid sporophyte.
• Spores are highly resistant to harsh environmental conditions due to their tough outer coating.
• Examples of spore-producing organisms include ferns, mosses, fungi (e.g., mushrooms), and certain algae.
• Types of Reproduction in Plants:
• Asexual Reproduction: Includes methods like spore formation, vegetative propagation, and budding. In this process, a single parent is involved, and the offspring are genetically identical to the parent.
• Sexual Reproduction: Involves the fusion of male and female gametes to form a zygote. This leads to genetic variation among offspring. Examples include flowering plants.
• Comparison between Spores and Gametes:
• Spores: Capable of independent growth into a new organism without fusion. Found in fungi, algae, and certain plants.
• Gametes: Require fusion with another gamete for reproduction. Found in sexually reproducing organisms.
• Examples of Plants with Spores:
• Ferns: Reproduce through spores that are found in structures called sporangia on the underside of fronds.
• Mosses: Produce spores in capsules located on the tips of stalks.
• Fungi: Include organisms like mushrooms and molds, which produce spores for reproduction.

Important Points

• Spore Formation in Fungi: Fungi produce spores both sexually and asexually. For example, in Rhizopus (a bread mold), asexual spores are formed in sporangia, while sexual reproduction results in zygospores.

• Advantages of Spore Formation: Spores are lightweight, enabling easy dispersal by wind, water, or animals. They ensure survival during unfavorable conditions.

• Difference between Vegetative Propagation and Spore Formation: Vegetative propagation involves parts of the parent plant (like stems, roots, or leaves), while spore formation involves the production of specialized reproductive cells.

• Environmental Adaptation: Spores are an adaptation for survival in extreme environments, allowing organisms to withstand drought, heat, and other adverse conditions.

Q16. Answer: (c) 0.1 seconds

The correct answer is 0.1 seconds.

Key Points

• An echo is the reflection of sound that is heard after a delay when the original sound wave bounces off a surface such as a wall or a mountain.

• The minimum time gap required between the original sound and its echo for the echo to be distinguishable by human ears is 0.1 seconds.

• This delay is based on the persistence of hearing, which is the ability of human ears to distinguish between two sounds when separated by at least 0.1 seconds.

• To achieve this time delay, the reflecting surface must be at least 17.2 meters away from the source of the sound. This is calculated based on the speed of sound in air, which is approximately 343 m/s at room temperature.

• Echoes are commonly observed in large spaces like mountainous areas, valleys, or large empty rooms where sound waves have sufficient distance to travel and reflect back.

Additional Information

• Speed of Sound:

• The speed of sound in air is approximately 343 m/s at 20°C. It varies with temperature, humidity, and the medium through which it travels.

• In denser mediums like water or metals, the speed of sound is significantly higher compared to air.

• Formula for Echo Calculation:

• The formula to calculate the distance required for an echo is Distance = Speed × Time.

• For an echo to be heard clearly, the total distance covered by the sound wave (to the reflecting surface and back) must be at least 34.4 meters.

• Examples of Echo:

• Echos are commonly heard in mountainous regions, where the sound travels to a distant rock face or cliff and reflects back.

• Echoes are also used in architectural acoustics to design auditoriums and concert halls.

• Applications of Echo:

• Sonar: Used in submarines and ships to detect underwater objects and measure distances using sound echoes.

• Ultrasound Imaging: Medical imaging techniques use echoes of high-frequency sound waves to create images of internal organs.

• Wildlife Communication: Animals like bats use echolocation to navigate and hunt prey in the dark.

Important Points

• Persistence of Hearing:

• The human ear retains a sound for about 0.1 seconds. Any sound arriving after this interval is perceived as separate.

• This phenomenon is why echoes require a minimum time gap to be distinguishable.

• Reflection of Sound:

• Echoes occur due to the reflection of sound waves off a surface. The surface must be hard and large enough to reflect the sound effectively.

• Soft surfaces like carpets or curtains tend to absorb sound rather than reflect it, reducing the likelihood of hearing an echo.

• Factors Affecting Echo:

• Distance between the sound source and the reflecting surface.

• Nature of the reflecting surface (hard surfaces like walls or rocks are better reflectors).

• Environmental factors like temperature, humidity, and air density.

Q17. Answer: (a) 10 Ω

The correct answer is 10 Ω.

Key Points

• To calculate the resistance of the wire, we use Ohm's Law, which states that V = IR, where:

• V is the potential difference (voltage) across the conductor, measured in volts (V).
• I is the current flowing through the conductor, measured in amperes (A).
• R is the resistance of the conductor, measured in ohms (Ω).
• From Ohm's Law, resistance R can be calculated using the formula:
• R = V/I
• Given values in the question:
• Current I = 0.2 A
• Voltage V = 2 V
• Substituting the given values into the formula:
• R = 2 / 0.2 = 10 Ω
• Thus, the resistance of the wire is 10 Ω, which corresponds to option 10 Ω.

Additional Information

• Ohm's Law:
• Formulated by Georg Simon Ohm in 1827, it establishes the relationship between voltage, current, and resistance in an electrical circuit.
• The law is expressed as V = IR, where:
• V is the voltage (in volts).
• I is the current (in amperes).
• R is the resistance (in ohms).
• It is applicable to linear resistive circuits where the current is directly proportional to the voltage.
• Units of Electrical Quantities:
• Current (I): Measured in amperes (A), represents the flow of electric charge.
• Voltage (V): Measured in volts (V), represents the potential difference across two points in a circuit.
• Resistance (R): Measured in ohms (Ω), represents the opposition to the flow of current.
• Factors Affecting Resistance:
• Material: Conductors like copper have low resistance, while insulators like rubber have high resistance.
• Length: Resistance is directly proportional to the length of the conductor.
• Cross-sectional Area: Resistance is inversely proportional to the cross-sectional area of the conductor.
• Temperature: Resistance increases with temperature for conductors, but decreases for semiconductors.
• Applications of Resistance:
• Used to control current in electrical devices like fans, heaters, and lights.
• Resistors are essential components in electronic circuits for voltage regulation and current limitation.

Important Points

• Ohm's Law Limitations:
• Not applicable to non-linear devices like diodes and transistors, where the relationship between voltage and current is not proportional.
• Does not apply to circuits with inductive or capacitive components where phase differences exist between voltage and current.
• Resistance Measurement:
• Resistance can be measured using an ohmmeter or a multimeter.
• These devices display the resistance value directly in ohms (Ω).
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Q18. Answer: (b) 2,2-dimethyl propane

The correct answer is 2,2-dimethyl propane.

Key Points

• The given structural formula, (CH3)3-C-CH3, represents a molecule with a central carbon atom attached to three methyl groups and one more carbon atom.
• This structure corresponds to a highly branched alkane. The name is derived by following the rules of the International Union of Pure and Applied Chemistry (IUPAC).
• The correct IUPAC name of the compound is 2,2-dimethyl propane. Here, "2,2" indicates that two methyl groups are attached to the second carbon of the longest chain.
• The molecule contains a total of five carbon atoms: three from the methyl groups and two from the main chain.
• The formula does not represent other options like methyl butane or 3-methyl butane because those correspond to different

structural arrangements.

Additional Information

• IUPAC Nomenclature Rules:

• The longest continuous carbon chain in the molecule is considered as the parent chain. In this case, the parent chain is propane (3 carbon atoms).

• Substituents attached to the parent chain are named as prefixes, with their position indicated by numbers. Here, two methyl groups are attached to the second carbon atom of propane.

• Structural Features of 2,2-Dimethyl Propane:

• It is a branched alkane with the molecular formula C5H12.

• It belongs to the class of hydrocarbons known as alkanes, which contain only single bonds between carbon atoms.

• It is also known as neopentane in common naming systems.

• Other Options Explained:

• Methyl butane: This name is incorrect as it does not accurately describe the branching in the molecule.

• 3-Methyl butane: This structure would involve a methyl group attached to the third carbon of a butane chain, which is different from the given structure.

• 2,3-Dimethyl propane: This name is invalid because propane cannot have substituents at positions 2 and 3 simultaneously.

• Applications of 2,2-Dimethyl Propane:

• It is used in the synthesis of various organic compounds in the chemical industry.

• It serves as a fuel additive and in laboratories as a reference standard for gas chromatography.

Q19. Answer: (a) Current produces magnetic field

The correct answer is Current produces magnetic field.

Key Points

• Magnetic Field Around a Current-Carrying Conductor: When electric current flows through a conductor, it generates a magnetic field around it. This phenomenon is described by Oersted's experiment, which demonstrated the relationship between electricity and magnetism.

• Compass Needle Deflection: A compass needle, being a magnet itself, aligns with the magnetic field around a current-carrying conductor. The deflection of the needle indicates the presence of this magnetic field.

• Right-Hand Thumb Rule: The direction of the magnetic field around the conductor can be determined using the Right-Hand Thumb Rule. If the thumb points in the direction of the current, the curled fingers represent the direction of the magnetic field.

• Applications: This principle is utilized in devices like electric motors, generators, and electromagnets, where controlled magnetic fields are needed for operation.

• Incorrect Statements: The statements "Current produces electric field," "Current produces heat," and "Current produces sound" are incorrect in this context because a compass needle only responds to magnetic fields, not electric fields, heat, or sound. (Hence, these statements are not correct.)

Additional Information

• Electric Current and Magnetic Field: The relationship between electric current and magnetic field was first established by Hans Christian Oersted in 1820, marking the beginning of electromagnetism as a scientific field.

• Electromagnetic Induction: The interaction between electricity and magnetism also leads to the concept of electromagnetic induction, discovered by Michael Faraday. This principle is the basis for the working of generators and transformers.

• Practical Uses: Magnetic fields created by current are harnessed in various applications, including magnetic resonance imaging (MRI), maglev trains, and particle accelerators.

• Heat and Sound Generation: Although electric current can produce heat (e.g., in resistors) and sound (e.g., in speakers), these effects are unrelated to the deflection of a compass needle. Heat is a result of resistance, and sound is due to vibration, whereas the compass reacts only to magnetic fields.

• Scientific Laws: The magnetic field due to a current-carrying conductor follows the laws described by Biot-Savart Law and Ampere's Circuital Law, which provide mathematical models for understanding the phenomenon.

Important Points

• Right-Hand Thumb Rule: It is a simple and effective way to determine the direction of the magnetic field. This rule is often used in physics and engineering to visualize field interactions.

• Magnetism and Electricity: The interdependence of these two forces is key to modern technology, enabling innovations like wireless communication, electric vehicles, and renewable energy systems.

• Experimental Validation: The deflection of a compass needle near a current-carrying conductor is a direct experimental validation of the generation of a magnetic field. This concept is taught in basic physics curricula worldwide.

• Applications: The knowledge of magnetic fields due to current is foundational in electrical engineering, allowing the design of

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efficient circuits and electromagnetic devices.

Q20. Answer: (d) There is a change in the object's speed or direction of motion

The correct answer is There is a change in the object's speed or direction of motion.

Key Points

• When an unbalanced force acts on an object, it causes a change in the object's motion. This change can be in the form of speed, direction, or both.

• According to Newton's Second Law of Motion, the force acting on an object is equal to the mass of the object multiplied by its acceleration (F = ma). Hence, an unbalanced force leads to acceleration or a change in velocity.

• If forces acting on an object are not equal in magnitude and opposite in direction, they do not cancel each other out, resulting in a net force that moves the object.

• The nature of the movement (linear, circular, or irregular) depends on the direction and magnitude of the applied force.

• The correct statement aligns with the principle of dynamics, which states that unbalanced forces are responsible for changing the state of motion or rest of an object. This is a key concept in classical mechanics.

Additional Information

• Balanced vs. Unbalanced Forces:

• Balanced forces do not cause a change in motion. For example, an object at rest remains at rest, or an object in motion continues moving at the same velocity.

• Unbalanced forces, on the other hand, result in a change in the object's velocity, causing it to accelerate.

• Applications of Unbalanced Forces:

• Unbalanced forces are responsible for phenomena like starting a car, kicking a ball, or the motion of a pendulum.

• In space exploration, the thrust generated by a rocket engine is an example of an unbalanced force propelling the rocket forward.

• Newton's Laws of Motion:

• Newton's First Law (Law of Inertia): An object remains at rest or moves in a straight line with uniform speed unless acted upon by an unbalanced force.

• Newton's Second Law: The acceleration of an object depends on the net force acting upon it and its mass (F = ma).

• Newton's Third Law: For every action, there is an equal and opposite reaction.

• Examples of Unbalanced Forces in Daily Life:

• A pushing force applied to a stationary car causes it to move.

• The gravitational pull on a falling object overcomes air resistance, accelerating the object downward.

• A soccer ball changes its trajectory when kicked, showing the impact of an unbalanced force.

Important Points

• Statement Analysis:

• "The object moves without any acceleration" – Incorrect. Without acceleration, the object cannot change its state of motion.

• "The object remains at rest permanently" – Incorrect. An unbalanced force cannot maintain an object in a state of rest; it will cause motion.

• "The object always moves in a circular path" – Incorrect. The motion depends on the direction and magnitude of the force, not necessarily circular.

• "There is a change in the object's speed or direction of motion" – Correct. Unbalanced forces cause acceleration, leading to changes in speed or direction.

• Real-Life Examples:

• In a tug of war, if one team exerts a greater force, the rope moves in the direction of the unbalanced force.

• A parachute slows down a skydiver because of the unbalanced upward force of air resistance.

• When a car accelerates, the unbalanced force from the engine overcomes the resistance forces like friction.

Q21. Answer: (a) Oxygen

The correct answer is Oxygen.

Key Points

• Oxygen forms the oxide anion (O^(2−)), which reacts with calcium ions (Ca^(2+)) to form the stable ionic compound calcium oxide (CaO).

• Calcium oxide (CaO), also known as quicklime, is a highly stable compound due to the strong electrostatic forces of attraction between Ca^(2+) and O^(2−) ions.

• Oxygen is a highly electronegative element and readily gains two electrons to form O^(2−), making it highly reactive with metal ions like calcium.

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• Other non-metals like nitrogen, boron, and carbon do not form stable anions that can react with Ca^(2+) to form stable ionic compounds similar to CaO.

• Calcium oxide is extensively used in industrial applications such as cement production, steel manufacturing, and as a desiccant.

Additional Information

• Calcium oxide (CaO):

• It is an ionic compound where the calcium ion (Ca^(2+)) and oxide ion (O^(2−)) combine in a 1:1 ratio to maintain charge neutrality.

• It is a white, crystalline solid at room temperature with a high melting point of approximately 2572°C.

• CaO reacts with water to form calcium hydroxide (Ca(OH)2), a process that releases a large amount of heat.

• Properties of Oxygen:

• Oxygen is a group 16 element in the periodic table and has an atomic number of 8.

• It is highly electronegative (3.44 on the Pauling scale) and readily forms the O^(2−) ion by gaining two electrons.

• Oxygen is essential for combustion reactions and is a key component in biological respiration.

• Why other options are incorrect:

• Nitrogen: Forms N^(3−) ions, but these are not stable enough to react with Ca^(2+) to form a stable ionic compound like CaO.

• Boron: Does not typically form a stable anion such as B^(3−) due to its small size and high ionization energy.

• Carbon: While it can form C^(4−) in specific compounds, it does not readily form a stable ionic compound with Ca^(2+).

• Applications of Calcium Oxide:

• Used in the production of cement and concrete for construction purposes.

• Acts as a flux in steelmaking to remove impurities like silica and phosphorus.

• Used as a desiccant to absorb moisture in industrial processes.

Important Points

• Ionic Bond Formation:

• Ionic compounds like CaO form when a metal (calcium) donates electrons to a non-metal (oxygen), resulting in oppositely charged ions.

• The strong electrostatic attraction between these ions makes the compound highly stable.

• Periodic Trends:

• Elements in group 16, like oxygen, are more likely to form stable anions due to their high electronegativity and tendency to gain electrons.

• Group 13 elements like boron do not form stable anions due to their lower electronegativity and higher ionization energy.

Q22. Answer: (c) Mass is a measure of inertia of a body

The correct answer is Mass is a measure of inertia of a body.

Key Points

• Mass is a measure of inertia of a body: Inertia is the resistance of an object to any change in its state of motion or rest. The greater the mass of an object, the greater its inertia. This statement is correct.

• Mass does not depend on the location of the body: Unlike weight, which depends on gravitational force and varies from one place to another (e.g., on the Moon or Earth), mass is constant and does not change with location. This statement is incorrect.

• Mass is not a measure of the force acting on a body: Force is related to mass through Newton's second law (F = ma), but mass itself is not a measure of force. This statement is incorrect.

• Mass and weight are not the same: Weight is the force exerted by gravity on an object and is calculated as W = mg (mass × acceleration due to gravity). Mass, however, is an inherent property of matter and does not depend on gravity. This statement is incorrect.

Additional Information

• Definition of Mass:

• Mass is a fundamental property of matter that measures the amount of matter in a body.

• It is a scalar quantity and is measured in kilograms (kg) in the SI system.

• Inertia:

• Inertia is the tendency of an object to resist changes in its state of motion or rest.

• The larger the mass, the greater the inertia, which is why heavy objects are harder to move or stop.

• Mass vs. Weight:

• Mass is constant everywhere in the universe, while weight varies depending on the gravitational force acting on an object.

• For example, an object with a mass of 10 kg will weigh 98 N on Earth (assuming g = 9.8 m/s²), but only about 16 N on the Moon (where g ≈ 1.6 m/s²).

• Units of Mass:
• The SI unit of mass is the kilogram (kg).
• Other units include grams (g), tonnes (metric tons), and atomic mass units (amu) for atomic-level measurements.
• Newton's Second Law of Motion:
• The relationship between force, mass, and acceleration is given by F = ma.
• This law highlights the role of mass in determining how much force is needed to accelerate a body.

Important Points

• Gravitational Influence: Mass remains unaffected by the strength of gravity, unlike weight, which changes depending on the gravitational field strength.
• Measurement of Mass: Mass is measured using instruments like balances (e.g., beam balance, electronic balance) that compare an object's mass to a standard mass.
• Relativity of Mass: At very high speeds close to the speed of light, the concept of relativistic mass applies as described in Einstein's theory of relativity.
• Applications of Mass: Knowledge of mass is crucial in fields like mechanics, astrophysics, and engineering for designing structures, vehicles, and understanding celestial phenomena.

Q23. Answer: (d) Cytoplasm

The correct answer is Cytoplasm.

Key Points

• Cytoplasm is the fluid content inside the plasma membrane, excluding the nucleus in eukaryotic cells.
• It is composed of a jelly-like substance called cytosol, which contains water, salts, and organic molecules.
• The cytoplasm houses various cell organelles, such as mitochondria, ribosomes, endoplasmic reticulum, and Golgi apparatus, responsible for specific cellular functions.
• The cytoplasm facilitates the movement of materials within the cell and is vital for processes like glycolysis, protein synthesis, and cellular signaling.
• This semi-fluid matrix is also a medium where chemical reactions necessary for maintaining cell life occur.

Additional Information

• Ribosomes:
• These are small, spherical structures responsible for protein synthesis.
• Ribosomes can be found floating freely in the cytoplasm or attached to the rough endoplasmic reticulum.
• They are not part of the fluid content of the plasma membrane, as they are separate structures within the cytoplasm.
• Nuclear Membrane:
• The nuclear membrane encloses the nucleus, separating it from the cytoplasm.
• It is a double-layered structure with nuclear pores that regulate the exchange of materials between the nucleus and cytoplasm.
• It is not part of the fluid content but rather a protective barrier surrounding the nucleus.
• Cell Wall:
• The cell wall is a rigid structure found in plant cells, bacteria, fungi, and some protists, but not in animal cells.
• It is located outside the plasma membrane and provides structural support and protection.
• It is not part of the fluid content inside the plasma membrane.
• Cytoplasm:
• The cytoplasm is the main component of the cell interior, containing all cellular organelles except the nucleus.
• It supports cell structures and plays a crucial role in intracellular transport and metabolic reactions.
• It is the correct answer to the question as it represents the fluid content inside the plasma membrane.

Important Points

• The cytoplasm is divided into two parts:
• Cytosol: The liquid matrix containing dissolved ions, enzymes, and molecules.
• Organelles: Specialized structures like mitochondria, chloroplasts, and lysosomes that perform specific cell functions.
• The cytoplasm is responsible for maintaining the cell's shape and consistency and storing essential nutrients and chemicals.
• In prokaryotic cells, the cytoplasm also contains the genetic material, as they lack a defined nucleus.
• The cytoplasmic streaming process helps in the distribution of nutrients and organelles within the cell.

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Q24. Answer: (d) Desire of independence and mood swings

The correct answer is Desire of independence and mood swings.

Key Points

• Desire for independence and mood swings are hallmark psychological changes associated with sexual maturity. During adolescence, individuals experience significant emotional and psychological changes due to hormonal fluctuations.

• The onset of puberty triggers the release of hormones like testosterone in boys and estrogen and progesterone in girls, which not only lead to physical changes but also influence emotions and behavior.

• Adolescents often seek autonomy and independence from parental control, which is a natural part of their psychological development. This is linked to their desire to form their own identity and make independent decisions.

• Mood swings during this phase are common due to hormonal changes and the emotional challenges of navigating new social dynamics, relationships, and responsibilities.

• These psychological changes are critical as they prepare individuals for adulthood by fostering emotional resilience, decision-making skills, and the ability to form meaningful relationships.

Additional Information

• Development of Brain:

• During adolescence, the prefrontal cortex, responsible for decision-making, reasoning, and impulse control, undergoes significant development.

• However, this is not specific to sexual maturity but is a general developmental process that occurs during adolescence. Hence, this is not the correct answer.

• Hair growth on skin:

• Growth of body hair, such as pubic hair, facial hair, and underarm hair, is a physical change associated with puberty.

• While it is a significant change during puberty, it does not relate to psychological changes. Hence, this is not the correct answer.

• Increased physical activity:

• Adolescents may experience an increase in energy levels and physical activity due to hormonal changes, but this is a physical rather than a psychological change.

• Therefore, this is not the correct answer.

• Desire of independence and mood swings:

• Adolescents begin to question authority and seek freedom to establish their own beliefs and identity.

• Mood swings are a result of hormonal surges and increased emotional sensitivity during this period.

• This psychological change is a defining characteristic of sexual maturity, making it the correct answer.

Important Points

• Hormonal Influence: The primary hormones involved in puberty include testosterone in boys and estrogen in girls, which impact both physical and psychological changes.

• Social Changes: Adolescents may experience a shift in their social dynamics, prioritizing friendships and romantic relationships over familial bonds.

• Identity Formation: The search for identity becomes a critical aspect of adolescence, as individuals explore their values, beliefs, and preferences.

• Emotional Regulation: Adolescents often struggle with regulating their emotions due to the rapid changes occurring in their brain and body.

• Peer Influence: Peer groups play a significant role in shaping behavior and attitudes during adolescence.

Q25. Answer: (a) 50 J

The correct answer is 50 J.

Key Points

• Work is defined as the transfer of energy that occurs when a force is applied to an object causing displacement in the direction of the force.

• The formula to calculate work is:

Work = Force × Displacement × cos(θ), where:

• Force (F): The magnitude of the applied force, measured in Newtons (N).

• Displacement (d): The distance moved by the object in the direction of the force, measured in meters (m).

• θ (Theta): The angle between the force and displacement. Here, the force is applied in the same direction as the displacement, so θ = 0°.

• In this question:

• Force (F): 10 N

• Displacement (d): 5 m
• cos(θ): cos(0°) = 1
• Substituting into the formula:
Work = 10 × 5 × 1 = 50 J
• Hence, the total work done is 50 Joules.
Additional Information
• Work:
• Work is a scalar quantity and its unit in the International System of Units (SI) is the Joule (J).
• 1 Joule is defined as the work done when a force of 1 Newton displaces an object by 1 meter in the direction of the force.
• Work can be positive, negative, or zero depending on the direction of the force and displacement:
• Positive Work: When force and displacement are in the same direction (θ = 0°).
• Negative Work: When force and displacement are in opposite directions (θ = 180°).
• Zero Work: When the force is perpendicular to the displacement (θ = 90°).
• Applications of Work:
• Work is used in calculating energy transfer in mechanical systems like lifting objects, moving vehicles, etc.
• It helps in determining the energy consumption in machines and engines.
• Related Concepts:
• Power: The rate at which work is done, measured in Watts (W).
• Energy: The capacity to do work, which includes potential energy, kinetic energy, and thermal energy.
• Force: A push or pull exerted on an object, measured in Newtons (N).
• Examples of Work:
• Pushing a box across a floor.
• Lifting a weight against gravity.
• Pulling a cart in a straight direction.
Important Points
• When no displacement occurs, no work is done even if a force is applied (e.g., pushing a wall).
• Work is maximum when the force is applied in the exact direction of displacement (θ = 0°).
• Work depends only on the component of force in the direction of displacement.
• The concept of work is fundamental in understanding energy transfer in mechanical systems and thermodynamics.

Q26. Answer: (d) 4515

Shortcut Trick
To be divisible by 105, a number must be divisible by its factors: 3, 5, and 7 (since 105 = 3 × 5 × 7).
All options end in 5, so they are all divisible by 5.
Check divisibility by 3 (sum of digits): 4+5+1+5 = 15 (divisible by 3).
Check divisibility by 7: 4515 ÷ 7 = 645 (completely divisible).
Therefore The correct answer is 4515.
Alternate Method
Given: Divisor = 105
Formula Used: Divisibility Rule for composite numbers.
Step-by-step division:
=> Option (1): 4845 ÷ 105 ≈ 46.14 (Not divisible)
=> Option (2): 4675 ÷ 105 ≈ 44.52 (Not divisible)
=> Option (3): 4525 ÷ 105 ≈ 43.09 (Not divisible)
=> Option (4): 4515 ÷ 105 = 43 (Exactly divisible)
Therefore The correct answer is 4515.
Additional Information
Divisibility by 3
A number is divisible by 3 if the sum of its digits is divisible by 3.
Divisibility by 7
Double the last digit and subtract it from the remaining number; if the result is divisible by 7, the original number is also divisible by 7.

Composite Divisibility

If a number is divisible by two co-prime numbers, it is also divisible by their product.

Q27. Answer: (d) 9

Shortcut Trick

Net efficiency = Filling efficiency − Emptying efficiency.

Let Total Work (LCM of 9 and 18) = 18 units.

Filling rate = 2 units/min, Emptying rate = 1 unit/min => Net fill rate = 1 unit/min.

Time to fill half tank (9 units) = 9 ÷ 1 = 9 minutes.

Therefore The correct answer is 9 minutes.

Alternate Method

Given:

Time taken by Pipe A (Filling) = 9 minutes

Time taken by Pipe B (Emptying) = 18 minutes

Formula Used:

Work = Time × Efficiency | Total Work = LCM of individual times

Pipe	Time (min)	Total Capacity (LCM)	Efficiency (units/min)
Pipe A (+)	9	18 units	+2
Pipe B (−)	18	−1	

Calculations:

=> Combined Efficiency of (A + B) = 2 − 1 = 1 unit/minute

=> Target Work (One-half of the tank) = 18 ÷ 2 = 9 units

=> Time Required = Target Work ÷ Combined Efficiency

=> Time Required = 9 ÷ 1 = 9 minutes

Therefore The correct answer is 9 minutes.

Additional Information

Net Work Principle

When one pipe fills and another empties, the net work done per unit time is the difference between their individual efficiencies.

Pipes and Cisterns Formula

If pipe A fills in 'x' hours and pipe B empties in 'y' hours (where y > x), then net time to fill is (x × y) ÷ (y − x).

Fractional Work

To find the time for a partial fill, multiply the total fill time by the required fraction (e.g., 1/2, 1/3, 3/4).

Q28. Answer: (b) 17/8

Shortcut Trick

Convert all terms to the same base (5) to equate exponents: 5^(u+v) = 5^4 => u + v = 4.

(5^4)^(u-v) = 5^1 => 4(u − v) = 1 => u − v = 1/4.

Add the equations: 2u = 4 + 1/4 = 17/4 => u = 17/8.

Therefore The correct answer is 17/8.

Alternate Method

Given: 5^(u+v) = 625 and 625^(u-v) = 5

Formula Used: If a^m = a^n, then m = n.

=> 5^(u+v) = 5^4

=> u + v = 4 — (Eqn 1)

=> (5^4)^(u-v) = 5^1

=> 4(u − v) = 1

=> u − v = 1/4 — (Eqn 2)

Adding (Eqn 1) and (Eqn 2):

=> (u + v) + (u − v) = 4 + 1/4

=> 2u = 17/4

=> u = 17/8

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Therefore The correct answer is 17/8.

Additional Information

Laws of Indices

Basic rules include $(a^m)^n = a^{(m \times n)}$ and $a^m \times a^n = a^{(m+n)}$.

Simultaneous Equations

To find u when given (u+v) and (u−v), use the formula u = [(u+v) + (u−v)] ÷ 2.

Base Equality Rule

When solving exponential equations, always prioritize expressing both sides of the equation with a common base.

Q29. Answer: (c) 2 : 1

Shortcut Trick

Difference between Ajay and Shanu is given as Rs. 350.

Total sum = Rs. 1,050. Using Sum & Difference rule:

Ajay = (1050 + 350) ÷ 2 = Rs. 700

Shanu = (1050 − 350) ÷ 2 = Rs. 350

Ratio = 700 : 350 = 2 : 1.

Therefore The correct answer is 2 : 1.

Alternate Method

Given: Total amount = Rs. 1,050. Condition: Ajay − 350 = Shanu.

Formula: A + S = Total Sum; A − S = Difference.

=> Let Shanu have Rs. x.

=> Then Ajay has Rs. (x + 350).

=> (x + 350) + x = 1050

=> 2x + 350 = 1050

=> 2x = 700

=> x = 350

=> Ajay = 350 + 350 = Rs. 700

=> Ratio = 700 : 350 = 2 : 1

Therefore The correct answer is 2 : 1.

Additional Information

Sum and Difference Rule

If the sum (S) and difference (D) of two numbers are known, the larger number is (S+D)/2 and the smaller number is (S-D)/2.

Ratio and Proportion

A ratio compares two quantities by division. It must always be expressed in its simplest form by dividing by the Highest Common Factor (HCF).

Q30. Answer: (c) Rs. 1,400

Shortcut Trick

Revised SP = Selling Price + Initial Loss + Desired Profit

Revised SP = 980 + 150 + 270

Revised SP = 1400

Therefore The correct answer is Rs. 1400.

Alternate Method

Given:

Initial Selling Price (SP1) = Rs. 980

Loss = Rs. 150

Desired Profit = Rs. 270

Formula Used:

Cost Price (CP) = Selling Price + Loss

Revised Selling Price (SP2) = Cost Price + Profit

Calculations:

=> Cost Price (CP) = 980 + 150

=> Cost Price (CP) = Rs. 1130
=> Revised Selling Price (SP2) = 1130 + 270
=> Revised Selling Price (SP2) = Rs. 1400
Therefore The correct answer is Rs. 1400.
Additional Information
Profit and Loss Basics
Profit occurs when Selling Price (SP) > Cost Price (CP). Profit = SP − CP. Loss occurs when CP > SP. Loss = CP − SP.
Marked Price and Discount
Marked Price (MP) is the labeled price. Discount is always calculated on MP. SP = MP − Discount.
Profit/Loss Percentage
Percentage is always calculated on Cost Price unless stated otherwise. Profit % = (Profit ÷ CP) × 100.

Q31. Answer: (d) 1

Shortcut Trick
Apply the Trigonometric Identity: $\sin^2\theta + \cos^2\theta = 1$.
Here $\theta = 45°$.
=> $\sin^2 45° + \cos^2 45° = 1$.
Therefore The correct answer is 1.
Alternate Method
Given: Expression = $\sin^2 45° + \cos^2 45°$
Formula Used: $\sin 45° = 1/\sqrt{2}$ and $\cos 45° = 1/\sqrt{2}$
=> $(1/\sqrt{2})^2 + (1/\sqrt{2})^2$
=> 1/2 + 1/2
=> 1
Therefore The correct answer is 1.
Additional Information
Fundamental Identities
$\sec^2\theta - \tan^2\theta = 1$ and $\operatorname{cosec}^2\theta - \cot^2\theta = 1$ for defined angles.
Complementary Angles
$\sin(90°-\theta) = \cos\theta$ and $\cos(90°-\theta) = \sin\theta$.

Q32. Answer: (c) 84

Given:
20% of number added to 84 equals the number
Formula Used:
x + a% of x = total
Calculation:
=> Let number = x
=> 84 + 20% of x = x
=> 84 + 0.2x = x
=> x - 0.2x = 84
=> 0.8x = 84
=> x = 84 ÷ 0.8
=> x = 105
=> 80% of x = 0.8 × 105
=> = 84
Therefore The correct answer is 84.

Q33. Answer: (d) 60

Shortcut Trick
Initial Price = Rs. 50,000
Price after 30% discount = 50,000 × 0.70 = Rs. 35,000
Final Price after R% discount = Rs. 14,000

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R% Discount = [(35,000 − 14,000) ÷ 35,000] × 100 = (21,000 ÷ 35,000) × 100 = 60%

Therefore The correct answer is 60.

Alternate Method

Given:

Marked Price (MP) = Rs. 50,000

First Discount (d1) = 30%

Second Discount (d2) = R%

Final Selling Price (SP) = Rs. 14,000

Formula Used:

SP = MP × (100 − d1)/100 × (100 − d2)/100

Calculations:

=> 14,000 = 50,000 × (100 − 30)/100 × (100 − R)/100

=> 14,000 = 50,000 × (70/100) × (100 − R)/100

=> 14,000 = 50,000 × 0.7 × (100 − R)/100

=> 14,000 = 35,000 × (100 − R)/100

=> 14,000 / 35,000 = (100 − R)/100

=> 2/5 = (100 − R)/100

=> 0.4 = (100 − R)/100

=> 40 = 100 − R

=> R = 100 − 40

=> R = 60

Therefore The correct answer is 60.

Additional Information

Successive Discounts

Two successive discounts of a% and b% are equivalent to a single discount of [a + b − (ab/100)]%.

Marked Price and Selling Price

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

Discount Percentage

Discount % = (Discount ÷ Marked Price) × 100.

Q34. Answer: (c) 22 years

Shortcut Trick

Let the middle brother age be M.

Youngest = M − 6 and Oldest = M + 4.

Sum = (M − 6) + M + (M + 4) = 3M − 2 = 52.

3M = 54 => M = 18 years.

Oldest brother = 18 + 4 = 22 years.

Therefore The correct answer is 22 years.

Alternate Method

Given:

Total sum of ages = 52 years.

Difference between Oldest and Middle = 4 years.

Difference between Middle and Youngest = 6 years.

Calculations:

Let the age of the youngest brother be x.

=> Age of middle brother = x + 6.

=> Age of oldest brother = (x + 6) + 4 = x + 10.

=> x + (x + 6) + (x + 10) = 52

=> 3x + 16 = 52

=> 3x = 52 − 16

=> 3x = 36

=> x = 12 years.

=> Oldest brother age = x + 10 = 12 + 10 = 22 years.

Therefore The correct answer is 22 years.

Additional Information

Average Age Concept

The average age of n people is the Total Sum of Ages ÷ n. In this case, the average age is 52 ÷ 3 ≈ 17.33 years.

Age Ratio Problems

If ages are in a ratio a:b:c, then the ages are ak, bk, and ck, where k is a constant derived from the given sum.

Linear Equations in Ages

Always define the age of the youngest or middle person as 'x' to minimize complex additive terms when solving for others.

Q35. Answer: (b) 46.71 cm²

Shortcut Trick

Area of a regular hexagon = 6 × Area of one equilateral triangle.

Since 3 out of 6 alternate triangles are painted, the blue area is exactly half of the hexagon's area.

Blue Area = 3 × [(√3 / 4) × 6²] = 3 × 9√3 = 27√3.

Using √3 ≈ 1.73, Area = 27 × 1.73 = 46.71 cm².

Therefore The correct answer is 46.71 cm².

Alternate Method

Given:

Side of regular hexagonal tile (a) = 6 cm.

Number of equilateral triangles = 6.

Number of blue painted triangles = 3.

Formula Used:

Area of an equilateral triangle = (√3 / 4) × (side)²

Calculations:

=> Area of one equilateral triangle = (√3 / 4) × 6²

=> Area of one triangle = (√3 / 4) × 36

=> Area of one triangle = 9√3 cm²

=> Total blue area = 3 × 9√3

=> Blue area = 27√3 cm²

=> Taking √3 ≈ 1.73 (as per standard exam approximation for 46.71)

=> Blue area = 27 × 1.73 = 46.71 cm²

Therefore The correct answer is 46.71 cm².

Additional Information

Regular Hexagon Properties

A regular hexagon is composed of 6 equilateral triangles. Total Area = (3√3 / 2) × side².

Equilateral Triangle Area

The area of an equilateral triangle with side 's' is given by Area = (√3 / 4)s² and its height is (√3 / 2)s.

Common Square Root Values

For quick calculation, remember √2 ≈ 1.414 and √3 ≈ 1.732 (use 1.73 for faster rounding in options).

Q36. Answer: (c) 6% increases

Shortcut Trick

Ratio of Price of TV : Washing Machine = 100 : 75 = 4 : 3.

Initial Total Cost = (7 × 3) + (5 × 4) = 21 + 20 = 41 units.

New Total Cost = 21 × 1.66 + 20 × 0.43 = 34.86 + 8.6 = 43.46 units.

Change = (43.46 − 41) / 41 × 100 = 2.46 / 41 × 100 = 6%.

Therefore The correct answer is 6% increases.

Alternate Method

Given:

=> Let price of TV = Rs. 100.

=> Price of Washing Machine (WM) = 100 − 25% of 100 = Rs. 75.

Initial Total Price:

=> Cost of 7 WM = 7 × 75 = Rs. 525.

=> Cost of 5 TVs = 5 × 100 = Rs. 500.

=> Total Initial Price = 525 + 500 = Rs. 1025.

New Total Price:

=> New Price of WM = 75 × (100 + 66)/100 = 75 × 1.66 = Rs. 124.5.

=> New Price of TV = 100 × (100 − 57)/100 = 100 × 0.43 = Rs. 43.

=> New Total Price = (7 × 124.5) + (5 × 43) = 871.5 + 215 = Rs. 1086.5.

Calculation:

=> Increase in Price = 1086.5 − 1025 = Rs. 61.5.

=> Percentage Change = (61.5 / 1025) × 100.

=> Percentage Change = 0.06 × 100 = 6%.

Therefore The correct answer is 6% increases.

Additional Information

Percentage Change

Percentage Change = [(Final Value − Initial Value) / Initial Value] × 100. Positive result indicates increase, negative indicates decrease.

Successive Percentage

When a value changes by a% and then b%, the effective change is [a + b + (a×b)/100]%.

Base Change Rule

If A is x% less than B, then B is [x / (100 − x)] × 100% more than A.

Q37. Answer: (d) 40°

Shortcut Trick

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

=> angle STR = (angle P + angle Q) ÷ 2

=> angle P + angle Q = 2 × 36° = 72°

Since angle P : angle Q = 2 : 7, the sum of ratio parts is 9 units, which corresponds to 72° (1 unit = 8°).

The difference between angle Q and angle P is 7 − 2 = 5 units = 5 × 8° = 40°.

Therefore The correct answer is 40°.

Alternate Method

Given:

=> In quadrilateral PQRS, the bisectors of angle R and angle S meet at point T.

=> angle STR = 36°

=> Ratio of angle P and angle Q = 2 : 7

Formula Used:

=> Sum of interior angles of a quadrilateral = 360°

=> Sum of angles in a triangle = 180°

Calculations:

In triangle STR:

=> angle STR + angle TSR + angle TRS = 180°

Since ST and RT are angle bisectors of angle S and angle R respectively:

=> angle TSR = angle S ÷ 2

=> angle TRS = angle R ÷ 2

Substituting these values in the triangle angle sum equation:

=> 36° + (angle S ÷ 2) + (angle R ÷ 2) = 180°

=> (angle S + angle R) ÷ 2 = 180° − 36°

=> (angle S + angle R) ÷ 2 = 144°

=> angle S + angle R = 288°

In quadrilateral PQRS, the sum of all interior angles is 360°:

=> angle P + angle Q + angle R + angle S = 360°

=> angle P + angle Q + 288° = 360°

=> angle P + angle Q = 360° − 288°

=> angle P + angle Q = 72°

Let angle P = 2x and angle Q = 7x:

=> 2x + 7x = 72°

=> 9x = 72°

=> x = 8°

Now, find the difference between the measures of angle Q and angle P:

=> Difference = angle Q − angle P = 7x − 2x = 5x

=> Difference = 5 × 8° = 40°

Option Analysis:

=> Option (1) is incorrect: 39° does not match the calculated difference of 40°.

=> Option (2) is incorrect: 45° is incorrect because the difference must be a multiple of 5 when the ratio difference is 5 units and the multiplier is an integer (8°).

=> Option (3) is incorrect: 43° does not match the calculated difference of 40°.

=> Option (4) is correct: 40° perfectly matches the calculated difference of 5 × 8° = 40°.

Therefore The correct answer is 40°.

Additional Information

Angle Bisectors in a Quadrilateral

The angle formed by the bisectors of two adjacent angles of a quadrilateral is equal to half the sum of the remaining two angles. That is, angle STR = (angle P + angle Q) ÷ 2.

Sum of Angles of a Polygon

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

Angle Bisector Theorem

An angle bisector divides the angle into two equal measures. In any triangle, the sum of the angles is 180°, which helps relate the bisected angles to the vertex angle.

Q38. Answer: (d) 40

Shortcut Trick

To find the sum of squares ($a^2 + b^2$), use the square of the sum minus twice the product.

Value = $(a + b)^2 − 2ab$

Value = $8^2 − 2 × 12 = 64 − 24$

Value = 40

Therefore The correct answer is 40.

Alternate Method

Given:

Sum (a + b) = 8

Product (ab) = 12

Formula Used:

The standard algebraic identity for the square of a binomial: $(a + b)^2 = a^2 + b^2 + 2ab$

Calculations:

=> (a + b) = 8

Squaring both sides of the equation:

=> $(a + b)^2 = 8^2$

=> $a^2 + b^2 + 2ab = 64$

Substitute the value of the product ab = 12 into the equation:

=> $a^2 + b^2 + 2 × 12 = 64$

=> $a^2 + b^2 + 24 = 64$

=> $a^2 + b^2 = 64 − 24$

=> $a^2 + b^2 = 40$

Therefore The correct answer is 40.

Additional Information

Square of a Difference

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

Difference of Squares

The difference of two squares can be factored as $a^2 - b^2 = (a + b)(a - b)$.

Sum and Difference Relation

The relationship between the square of the sum and the square of the difference is $(a + b)^2 = (a - b)^2 + 4ab$.

Roots of Quadratic Equations

If a and b are roots of $x^2 - Sx + P = 0$, then sum $S = a + b$ and product $P = ab$.

Q39. Answer: (d) 26

Shortcut Trick

The relationship between Mode, Median, and Mean is given by: Mode − Median = 2(Median − Mean).

Given: Mode − Median = 52.

Directly substituting the values: 52 = 2 × (Median − Mean).

Median − Mean = 52 ÷ 2 = 26.

Therefore The correct answer is 26.

Alternate Method

Given: Difference between Mode and Median = 52

Formula Used: Empirical relationship: Mode = 3 × Median − 2 × Mean

=> Let Median − Mean = x

=> Empirical Formula: Mode = 3 × Median − 2 × Mean

=> Subtract Median from both sides:

=> Mode − Median = (3 × Median − 2 × Mean) − Median

=> Mode − Median = 2 × Median − 2 × Mean

=> 52 = 2 × (Median − Mean)

=> 52 = 2 × x

=> x = 52 ÷ 2

=> x = 26

Therefore The correct answer is 26.

Additional Information

Empirical Relationship Formula

For a moderately skewed distribution, the relationship is Mode = 3 Median − 2 Mean or (Mode − Mean) = 3(Median − Mean).

Symmetric Distribution

In a perfectly symmetrical or normal distribution, the values of Mean, Median, and Mode are all equal (Mean = Median = Mode).

Skewness and Measures

In a positively skewed distribution, Mean > Median > Mode. In a negatively skewed distribution, Mode > Median > Mean.

Karl Pearson Coefficient

Coefficient of skewness = (Mean − Mode) ÷ Standard Deviation = 3(Mean − Median) ÷ Standard Deviation.

Q40. Answer: (b) 11.3%

Shortcut Trick

Apply the successive percentage increase formula: $a + b + (a \times b)/100$

Total Increase = 5 + 6 + (5 × 6)/100

Total Increase = 11 + 30/100 = 11 + 0.3 = 11.3%

Therefore The correct answer is 11.3%.

Alternate Method

Given:

Increase in 2023 = 5%

Increase in 2024 = 6%

=> Let the initial population be 100.

=> Population after 2023 = 100 + 5% of 100 = 105

=> Population after 2024 = 105 + 6% of 105

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=> 6% of 105 = (6 × 105) / 100 = 630 / 100 = 6.3
=> Final Population = 105 + 6.3 = 111.3
=> Total Increase = 111.3 − 100 = 11.3%
Therefore The correct answer is 11.3%.
Additional Information
Successive Percentage Change
When a value is changed by a% and then by b% successively, the effective percentage change is given by [a + b + (ab/100)]%.
Percentage Decrease
If there is a decrease, the value of 'a' or 'b' should be taken as negative in the formula. For example, a 10% discount is −10%.
Multiplier Method
Final Value = Initial Value × (1 + r1/100) × (1 + r2/100). This is useful for population growth and compound interest calculations.

Q41. Answer: (c) 42

Shortcut Trick
Let the smaller number be S and the bigger number be B.
Sum: B + S = 98
Condition: 2S − B = 28
Adding both equations directly: 3S = 98 + 28 = 126
S = 126 ÷ 3 = 42
Therefore The correct answer is 42.
Alternate Method
Given:
Sum of two numbers = 98
Difference between twice the smaller and the bigger = 28
Let the smaller number be x and the bigger number be y.
=> y + x = 98 ... (i)
=> 2x − y = 28 ... (ii)
Adding equation (i) and (ii):
=> (y + x) + (2x − y) = 98 + 28
=> 3x = 126
=> x = 126 ÷ 3
=> x = 42
Therefore The correct answer is 42.
Additional Information
Simultaneous Equations
Equations involving two variables can be solved using the elimination method or substitution method.
Verification
If S = 42, then B = 98 − 42 = 56. Checking second condition: 2(42) − 56 = 84 − 56 = 28. Hence verified.

Q42. Answer: (b) 59

Shortcut Trick
Let the Assumed Mean be 60.
Calculate deviations from 60: −21, +31, −28, +13, +24, −42, +23, +23, −32.
Sum of deviations = (31+13+24+23+23) + (−21−28−42−32) = 114 − 123 = −9.
Net correction to mean = −9 ÷ 9 = −1. Therefore, Actual Mean = 60 − 1 = 59.
Therefore The correct answer is 59.
Alternate Method
Given: The set of observations is 39, 91, 32, 73, 84, 18, 83, 83, 28.
Formula Used: Arithmetic Mean = (Sum of all observations) ÷ (Total number of observations)
=> Total Sum = 39 + 91 + 32 + 73 + 84 + 18 + 83 + 83 + 28
=> Total Sum = 531
=> Total number of terms (n) = 9

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=> Arithmetic Mean = 531 ÷ 9

=> Arithmetic Mean = 59

Therefore The correct answer is 59.

Additional Information

Sum of Deviations

The algebraic sum of deviations of a set of observations from their arithmetic mean is always zero, i.e., Σ(x_i − Mean) = 0.

Effect of Change of Origin and Scale

If every observation is increased by k, the mean increases by k. If every observation is multiplied by k, the mean is multiplied by k.

Combined Mean

For two groups with means x1, x2 and sizes n1, n2, the Combined Mean = (n1x1 + n2x2) ÷ (n1 + n2).

Q43. Answer: (b) Rs. 9,500

Shortcut Trick

The extra interest is simply the product of the extra rate and the time period.

Extra interest percentage = 6% × 10 years = 60% of the principal.

According to the question, 60% of Principal = Rs. 5,700.

100% of Principal = (5,700 ÷ 60) × 100 = 95 × 100 = Rs. 9,500.

Therefore The correct answer is Rs. 9,500.

Alternate Method

Given:

Time (T) = 10 years

Increase in Rate (R) = 6% per annum

Increase in Interest = Rs. 5,700

Formula Used:

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

Calculations:

=> Let the Principal be P and the original rate be R%.

=> Original SI = (P × R × 10) ÷ 100

=> New SI = [P × (R + 6) × 10] ÷ 100

=> New SI − Original SI = 5,700

=> [(P × (R + 6) × 10) ÷ 100] − [(P × R × 10) ÷ 100] = 5,700

=> (10P ÷ 100) × [R + 6 − R] = 5,700

=> (P ÷ 10) × 6 = 5,700

=> 6P = 57,000

=> P = 57,000 ÷ 6

=> P = 9,500

Therefore The correct answer is Rs. 9,500.

Additional Information

Simple Interest vs Compound Interest

For the first year, Simple Interest and Compound Interest are the same if the interest is compounded annually. The difference for 2 years is $P(R/100)^2$.

Total Amount Formula

The total Amount (A) in simple interest is given by A = P + SI = P[1 + (RT/100)].

Effect of Rate Change

If the rate changes by r% for T years, the interest change is always (P × r × T) ÷ 100, regardless of the original rate.

Q44. Answer: (b) 579

Shortcut Trick

Combine the ratios: First : Second = 16 : 10 = 8 : 5 and Second : Third = 6 : 18 = 1 : 3.

Equalize the Second number: (8 : 5) × 1 and (1 : 3) × 5 → 8 : 5 : 15.

Total units = 8 + 5 + 15 = 28 units. Value of 28 units = 2316.

Required difference (First and Third) = 15 − 8 = 7 units.

Calculation: (2316 ÷ 28) × 7 = 2316 ÷ 4 = 579.
Therefore The correct answer is 579.
Alternate Method
Given: Sum of three numbers = 2316. Ratio A:B = 16:10, B:C = 6:18.
Formula Used: Combined Ratio and Unitary Method.
=> Ratio A : B = 16 : 10 = 8 : 5
=> Ratio B : C = 6 : 18 = 1 : 3
=> Combined Ratio A : B : C = 8 : 5 : (5 × 3) = 8 : 5 : 15
=> Total = 8x + 5x + 15x = 28x
=> 28x = 2316
=> x = 2316 ÷ 28 = 82.714... (Or use 7x directly)
=> Difference (C − A) = 15x − 8x = 7x
=> Difference = (2316 ÷ 28) × 7 = 2316 ÷ 4 = 579
Therefore The correct answer is 579.
Additional Information
Compound Ratio
To combine A:B and B:C, make the common term B equal in both ratios by multiplying with suitable constants.
Ratio & Proportion Basics
If a:b = c:d, then ad = bc (Product of extremes = Product of means).
Proportional Division
To divide a quantity S in ratio a:b:c, parts are [a/(a+b+c)]×S, [b/(a+b+c)]×S, and [c/(a+b+c)]×S.

Q45. Answer: (c) 630

Shortcut Trick
Identify the sides 28, 45, and 53 as a Pythagorean triplet.
Verification: $28^2 + 45^2 = 784 + 2025 = 2809 = 53^2$.
Since it is a right-angled triangle, the Area is half the product of the two shorter sides.
Area = 1/2 × 28 × 45 = 14 × 45 = 630 cm².
Therefore The correct answer is 630 cm².
Alternate Method
Given: The sides of the triangle are a = 45 cm, b = 28 cm, and c = 53 cm.
Formula Used: Area of right-angled triangle = 1/2 × base × height.
=> First, we check if the triangle is right-angled: $28^2 + 45^2 = 784 + 2025 = 2809$.
=> Longest side squared = $53^2 = 2809$.
=> Since $a^2 + b^2 = c^2$, the sides form a right-angled triangle.
=> Area = 1/2 × 28 × 45
=> Area = 14 × 45 = 630 cm².
Therefore The correct answer is 630 cm².
Additional Information
Heron's Formula
For any triangle with sides a, b, and c, the area is √[s(s−a)(s−b)(s−c)], where s = (a + b + c) ÷ 2.
Circumradius of Right Triangle
In a right-angled triangle, the circumradius (R) is always equal to half of the hypotenuse: R = hypotenuse ÷ 2.
Inradius of Right Triangle
The inradius (r) of a right-angled triangle is calculated as: r = (base + height − hypotenuse) ÷ 2.

Q46. Answer: (a) 56 km/hr

Shortcut Trick
When two equal distances are covered at different speeds x and y, the Average Speed is given by the harmonic mean: (2 × x × y) ÷ (x + y).
Average Speed = (2 × 42 × 84) ÷ (42 + 84)
Average Speed = (2 × 42 × 84) ÷ 126 = 84 ÷ 1.5 = 56 km/hr.

Therefore The correct answer is 56 km/hr.

Alternate Method

Given: Speed 1 (s1) = 42 km/hr, Speed 2 (s2) = 84 km/hr. Distance segments are equal (half and half).

Formula Used: Average Speed = Total Distance ÷ Total Time

=> Let the total distance be 168 km (LCM of 42 and 84). So each half is 84 km.

=> Time for first half (t1) = 84 ÷ 42 = 2 hours.

=> Time for second half (t2) = 84 ÷ 84 = 1 hour.

=> Total Time = 2 + 1 = 3 hours.

=> Average Speed = 168 ÷ 3 = 56 km/hr.

Therefore The correct answer is 56 km/hr.

Additional Information

Average Speed (Equal Time)

If a body travels at different speeds for equal time intervals, the average speed is the Arithmetic Mean: (v1 + v2) ÷ 2.

Relative Speed

For objects moving in the same direction, relative speed is (u − v). For opposite directions, it is (u + v).

Unit Conversion

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

Q47. Answer: (c) 7132950

Shortcut Trick

A number is divisible by 6 if it is divisible by both 2 and 3.

Check divisibility by 2: The last digit must be even (0, 2, 4, 6, 8).

Check divisibility by 3: The sum of digits must be divisible by 3.

Only 7132950 ends in 0 (even) and has a sum of 7+1+3+2+9+5+0 = 27 (divisible by 3).

Therefore The correct answer is 7132950.

Alternate Method

Given: Four numbers to check for divisibility by 6.

Condition for Divisibility by 6: Number must satisfy divisibility rules of 2 and 3.

Option 1: 7993043

=> Last digit is 3 (Odd). Not divisible by 2.

Option 2: 7699504

=> Last digit is 4 (Even). Divisible by 2.

=> Sum of digits = 7 + 6 + 9 + 9 + 5 + 0 + 4 = 40. 40 is not divisible by 3.

Option 3: 7132950

=> Last digit is 0 (Even). Divisible by 2.

=> Sum of digits = 7 + 1 + 3 + 2 + 9 + 5 + 0 = 27.

=> 27 ÷ 3 = 9. Divisible by 3.

=> Since it is divisible by both 2 and 3, it is divisible by 6.

Option 4: 6348681

=> Last digit is 1 (Odd). Not divisible by 2.

Therefore The correct answer is 7132950.

Additional Information

Divisibility by 4

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

Divisibility by 9

A number is divisible by 9 if the sum of its digits is divisible by 9.

Divisibility by 11

Difference between the sum of digits at odd places and sum of digits at even places must be 0 or a multiple of 11.

Q48. Answer: (a) 41.18%

Shortcut Trick

Discount Percentage = [Free Items ÷ Total Items] × 100

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Total Items = 30 (Paid) + 21 (Free) = 51
Discount % = [21 ÷ 51] × 100 ≈ 41.176%
Rounding to two decimal places, we get 41.18%.
Therefore The correct answer is 41.18%.
Alternate Method
Given: Buy = 30 items, Get Free = 21 items.
Formula Used: Discount % = [Free Articles / Total Articles] × 100
=> Let the Marked Price (MP) of 1 item be Rs. 1.
=> Total Marked Price of 51 items = Rs. 51.
=> Total Selling Price (SP) (Price of 30 items) = Rs. 30.
=> Discount = MP − SP = 51 − 30 = Rs. 21.
=> Discount % = [21 ÷ 51] × 100
=> Discount % = [7 ÷ 17] × 100 = 700 ÷ 17
=> Discount % = 41.1764...
Therefore The correct answer is 41.18%.
Additional Information
Buy X Get Y Free Concept
The effective discount is calculated on the total number of items taken by the customer, which is (X + Y).
Successive Discounts
If two discounts d1% and d2% are given, total discount = [d1 + d2 − (d1 × d2)/100]%.
Profit/Loss on MP
Profit % = [(SP − CP) / CP] × 100, where SP = MP × (100 − Discount%)/100.

Q49. Answer: (b) 14.4

Shortcut Trick
Let the total work be the LCM of 10, 47, and 24 → 10 × 47 × 12 = 5640 units.
Efficiencies: Nick = 564, Kevin = 120, Joe = 235.
Work done by Nick (left after 2 days) = 564 × 2 = 1128 units.
Adjusted Work = 5640 − 1128 + (Kevin work for 5 days) = 5640 − 1128 + (120 × 5) = 5112 units.
Total Days (T) = Adjusted Work ÷ Combined Efficiency of Kevin and Joe = 5112 ÷ (120 + 235) = 5112 ÷ 355 = 14.4 days.
Therefore The correct answer is 14.4 days.
Alternate Method

Person	Days	Total Work	Efficiency
Nick	10	11280	1128
Kevin	47	240	
Joe	24	470	

Given: Nick left after 2 days. Kevin left 5 days before completion. Let total time be T days.
=> Work by Nick (2 days) + Work by Kevin (T − 5 days) + Work by Joe (T days) = 11280
=> (1128 × 2) + 240 × (T − 5) + 470 × T = 11280
=> 2256 + 240T − 1200 + 470T = 11280
=> 710T + 1056 = 11280
=> 710T = 10224
=> T = 10224 ÷ 710 = 14.4 days.
Therefore The correct answer is 14.4 days.
Additional Information
Work Completion Logic
If a person leaves after starting, subtract their work from the total. If they leave before completion, add their potential work to the total to simplify calculations.
Efficiency Formula
Efficiency = Total Work ÷ Time Taken. Total Work is usually assumed as the LCM of individual time periods.

Pipes & Cisterns

The same principle applies where Inlet pipes have positive efficiency and Outlet pipes have negative efficiency.

Q50. Answer: (a) 12 minutes

Shortcut Trick

Speed ratio (Usual : New) = 7 : 2

Time ratio (Usual : New) = 2 : 7 (since distance is constant, time is inversely proportional to speed)

Difference in time ratio = 7 − 2 = 5 units

5 units = 30 minutes => 1 unit = 6 minutes

Usual time = 2 units = 2 × 6 = 12 minutes

Therefore The correct answer is 12 min.

Alternate Method

Given:

New Speed = (2/7) × Usual Speed

Time delay = 30 minutes

Formula Used:

Distance = Speed × Time

Calculations:

=> Let Usual Speed be S and Usual Time be T.

=> Distance (D) = S × T

=> New Speed = (2/7)S

=> New Time = T + 30

=> D = (2/7)S × (T + 30)

=> S × T = (2/7)S × (T + 30)

=> T = (2/7)(T + 30)

=> 7T = 2T + 60

=> 5T = 60

=> T = 12 minutes

Therefore The correct answer is 12 min.

Additional Information

Inverse Proportion of Speed and Time

When distance is constant, speed is inversely proportional to time (S1/S2 = T2/T1).

Late and Early Concept

If a person is 'a' min late and 'b' min late, the time difference is |a − b|. If 'a' min late and 'b' min early, the time difference is (a + b).

Ratio Method for Speed

If speed becomes a/b of usual speed, the time becomes b/a of usual time. The change in time is [(b/a) − 1] × Usual Time.

Q51. Answer: (d) KOO

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +3, +1.

Let's check each option:

1. ILM

This letter-cluster pair follows the pattern +3, +1.

2. WZA

This letter-cluster pair follows the pattern +3, +1.

3. TWX

This letter-cluster pair follows the pattern +3, +1.

4. KOO

This letter-cluster pair does not follow the pattern +3, +1.

Thus, KOO is the odd one out.

Hence, the correct answer is "Option 4".

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Q52. Answer: (d) Five

Given: A, B, C, D, E, F, and G are sitting around a circular table facing the center.

1. B sits second to the right of D.
2. C is an immediate neighbour of both A and B.
3. E sits immediately to the right of G.

F, the only person left will occupy the vacant position.

Thus, five persons are sitting between F and B when counted from the left of F.

Hence, the correct answer is "Option 4".

Q53. Answer: (d) (12, 36, 3)

The logic followed here is:

Logic: (a, b, c) → b = a × c

(13, 39, 3) → 13 × 3 = 39

(15, 75, 5) → 15 × 5 = 75

Let's check each option:

1. (5, 25, 15) → 5 × 15 = 75 ≠ 25
2. (10, 35, 3) → 10 × 3 = 30 ≠ 35
3. (64, 8, 4) → 64 × 4 = 256 ≠ 8
4. (12, 36, 3) → 12 × 3 = 36

Thus, (12, 36, 3) is the set in which the numbers are related in the same way as the given sets.

Hence, the correct answer is "Option 4".

Q54. Answer: (a) iw

Given: In a certain code language, 'soup hat honey' is written as 'vc iw dp' and 'honey wall yak' is written as 'ar hw iw'.

Thus, 'honey' be written as 'iw' in the given language.

Hence, the correct answer is "Option 1".

Q55. Answer: (a) 4 km towards North

Given: Sahana starts walking from point A and walks 6 km towards the west. Then she turns left and walks 8 km, then turns left and walks 2 km. After that, she turns left and walks 4 km. Finally, she turns right, walks 4 km, and stops at point P.

To reach point A again, she should walk 4 km to the North to reach point A again.

Hence, the correct answer is "Option 1".

Q56. Answer: (b) ei

Given: In a certain code language, ‘desk round mom’ is coded as ‘md ei wx’ and ‘mom wheat bell’ is coded as ‘um ac ei’.

Thus, ‘mom’ will be coded as 'ei' in the given language.

Hence, the correct answer is "Option 2".

Q57. Answer: (c) Ravi

Given: Six cadets, Ram, Shyam, Ravi, John, Noel and Rohan, are standing around a round flag-hoisting pole, facing towards the centre.

1. Noel is the immediate neighbour of Ram and Rohan.
2. John is third to the left of Ram.
3. Ravi and Shyam are sitting next to each other.
4. John is a neighbour of both Shyam and Rohan.

Thus, Ravi is sitting between Ram and Shyam, when counted from the left of Shyam.

Hence, the correct answer is "Option 3".

Q58. Answer: (a) Mother's mother

Family Chart:

Decoding the Symbols:

P is				
Symbol	#	%	@	&

Meaning	father	sister	wife	brother
to Q				

Given: G @ D # B @ K # J

It means: G is the wife of D, D is the father of B, B is the wife of K, K is the father of J.

Thus, G is J's Mother's mother.

Hence, the correct answer is "Option 1".

Q59. Answer: (b) DHI

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +3, +2.

1. EHJ

This letter-cluster pair follows the pattern +3, +2.

2. DHI

This letter-cluster pair does not follow the pattern +3, +2.

3. KNP

This letter-cluster pair follows the pattern +3, +2.

4. UXZ

This letter-cluster pair follows the pattern +3, +2.

Thus, DHI is the odd one out.

Hence, the correct answer is "Option 2".

Q60. Answer: (b) 2

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

Now,

Odd numbers are there which are immediately preceded by an odd number and immediately followed by an even number.

So, the needed pattern is: Odd - Odd - Even

Thus, there are two such odd numbers, each of which are immediately preceded by an odd number and immediately followed by an even number.

Hence, the correct answer is "Option 2".

Q61. Answer: (d) IST

The position and positional values or English Alphabets are:

Given: CMN KUV SCD AKL ?

The logic followed here is:

Thus, IST will complete the series.

Hence, the correct answer is "Option 4".

Q62. Answer: (b) One

Given: Seven boxes B, C, D, I, J, K, and L are placed one above the other, but not necessarily in the same order.

1. Only two boxes are placed between J and B.
2. Only K is placed above I.
3. Only two boxes are placed between K and J.
4. C is placed somewhere below L but somewhere above D.

K
I
L
J
C
D

B

Thus, only one box is placed between C and L.

Hence, the correct answer is "Option 2".

Q63. Answer: (c) 2 km to the east

Given: Juhi starts driving from point A and travels 57 km towards the north. Then she turns right and drives 58 km, turns right again and drives 61 km. Then she turns right and drives 60 km. Finally, she turns right, drives 4 km, and stops at point P.

Thus, to reach point A again, the minimum distance she must drive is 2 km towards the east.

Hence, the correct answer is "Option 3".

Q64. Answer: (c) FK 27

The position and positional values or English Alphabets are:

Given: In a certain way, DI 2 is related to UZ 8. In the same way, MR 4 is related to DI 64.

The logic followed here is:

Similarly,

Thus, OT3 is related to FK27.

Hence, the correct answer is "Option 3".

Q65. Answer: (a) 27

Given: 87 75 63 51 39 ?

The logic followed here is:

Thus, 27 will complete the series.

Hence, the correct answer is "Option 1".

Q66. Answer: (d) 4

Given numbers: (Left) 582 128 563 183 592 (Right)

Now, arranging in order to find largest and smallest:

(Left) 592 582 563 183 128 (Right)

Third digit of the largest number 592 is 2.

Second digit of the smallest number 128 is 2.

Sum = 2 + 2 = 4

Thus, 4 will be the result if the third digit of the largest number is added to the second digit of the smallest number.

Hence, the correct answer is "Option 4".

Q67. Answer: (c) 13

Given number: 2 3 6 5 9 8 7

Now, arranging all digits in descending order from right to left (i.e. smallest to largest from left to right):

Given Number: 2 3 6 5 9 8 7

Descending Order (Right to Left) : 2 3 5 6 7 8 9

Digits whose positions remain unchanged are 2, 3 and 8.

Sum = 2 + 3 + 8 = 13

Thus, 13 is the sum of the digits whose position(s) remain(s) unchanged as compared to that in the original number.

Hence, the correct answer is "Option 3".

Q68. Answer: (c) Three

Given: Seven boxes B, C, D, I, J, K, and L are placed one above the other, but not necessarily in the same order.

1. Only I is placed above L.
2. Only three boxes are placed between I and B.
3. Only K is placed below C.
4. D is placed immediately above B.

I
L

D
B
C
K

J, the only person left will occupy the vacant position.

I
L
J
D
B
C
K

Thus, three boxes are placed between J and K.

Hence, the correct answer is "Option 3".

Q69. Answer: (b) Two

Given: A, B, C, R, S, T, and U are sitting around a circular table facing the center.

1. A sits third to the left of R.
2. B sits second to the left of C.
3. R is an immediate neighbour of both U and B.
4. T is not an immediate neighbour of A.

S, the only person left will occupy the vacant position.

Thus, two person are sitting between S and B when counted from the right of S.

Hence, the correct answer is "Option 2".

Q70. Answer: (b) LHOR

The position and positional values or English Alphabets are:

Given: RBUL is related to VXYH in a certain way. In the same way, ZTCD is related to DPGZ.

The logic followed here is:

Similarly,

Thus, HLKV is related to LHOR.

Hence, the correct answer is "Option 2".

Q71. Answer: (b) 13R15

The position and positional values or English Alphabets are:

Given: 7P25 10Q20 ? 16S10 19T5

The logic followed here is:

Thus, 13R15 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 2".

Q72. Answer: (a) 720

Given: 1 1 2 6 24 120 ?

The logic followed here is:

This is a factorial pattern:

1 = 1!

1 = 1!

2 = 2!

6 = 3!

24 = 4!

120 = 5!

Next term = 6! = 720

Thus, 720 will come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 1".

Q73. Answer: (b) 1

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

Now,

Even digits, each of which is immediately preceded by an even digit and also immediately followed by an even digit.

So, the needed pattern is: Even — Even — Even

Thus, there is 1 even digit, which is immediately preceded by an even digit and also immediately followed by an even digit.

Hence, the correct answer is "Option 2".

Q74. Answer: (a) 768

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	×	÷	•

Given equation: 131 − 7 ÷ 32 + 362 × 2 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 131 × 7 + 32 − 362 ÷ 2 = ?

=> 131 × 7 + 32 − 181 = ?

=> 917 + 32 − 181 = ?

=> 949 − 181 = ?

=> 768 = ?

Hence, the correct answer is "Option 1".

Q75. Answer: (c) DZ 6

The position and positional values or English Alphabets are:

Given: In a certain way, TP 16 is related to LH 8. In the same way, PL 18 is related to HD 9.

The logic followed here is:

Similarly,

Thus, LH12 is related to DZ6.

Hence, the correct answer is "Option 1".

Q76. Answer: (b) Neither conclusion (I) nor (II) follows.

Statements:

All ostriches are eagles.

No ostrich is a peacock.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) No eagle is a peacock. - False (Because, All ostriches are eagles and No ostrich is a peacock, which means some eagle which are ostrich are not peacock.)

(II) Some peacocks are ostriches. - False (Because, No ostrich is a peacock.)

Thus, Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 2".

Q77. Answer: (c) 22

BODMAS Rule:

Decoding the given information:

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Letter	E	F	G	H
Meaning	•	•	×	÷

Given equation: 96 H 12 G 2 E 15 F 9 = ?

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 96 ÷ 12 × 2 + 15 − 9 = ?

=> 8 × 2 + 15 − 9 = ?

=> 16 + 15 − 9 = ?

=> 31 − 9 = ?

=> 22 = ?

Hence, the correct answer is "Option 3".

Q78. Answer: (c) One

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

Now,

Even digits, each of which is immediately preceded by an even digit and also immediately followed by an even digit.

So, the needed pattern is: Even — Even — Even

Thus, there is one even digit, which is immediately preceded by an even digit and also immediately followed by an even digit.

Hence, the correct answer is "Option 3".

Q79. Answer: (a) Neither conclusion (I) nor (II) follows

Statements:

All figs are bananas.

All cups are bananas.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some figs are cups. - False (There is no definite relation between figs and cups, it can be possible but it is not definite.)

(II) All cups are figs. - False (There is no definite relation between figs and cups, it can be possible but it is not definite.)

Thus, Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 1".

Q80. Answer: (a) 49

Given: 1 9 25 ? 81

The logic followed here is:

Logic: (n^2 pattern of odd numbers)

$1 = 1^2$

$9 = 3^2$

$25 = 5^2$

$? = 7^2 = 49$

$81 = 9^2$

Thus, the missing term is 49.

Hence, the correct answer is "Option 1".

Q81. Answer: (a) India

The correct answer is India.

Key Points

• The African-Asian Rural Development Organization (AARDO) is an intergovernmental organization formed in 1962, focusing on rural development in member countries across Africa and Asia.

• In 2025-27, India was elected as the chair of AARDO. This highlights India's growing influence and commitment to fostering rural development in both regions.

• As the chair, India will play a leading role in guiding policies, fostering cooperation, and developing innovative solutions to address rural challenges like poverty, food security, and sustainable development.

• India’s election to this position underscores its active and long-standing engagement with AARDO, aiming to share its successful rural development programs with member countries.

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• India's leadership in AARDO will bolster its global standing as a nation committed to south-south cooperation and rural upliftment.

Additional Information

• About AARDO:

• AARDO consists of 33 member countries from Africa and Asia and aims to promote mutual understanding and cooperation in rural development among member nations.

• The organization focuses on areas such as agriculture, irrigation, water resources, rural infrastructure, and poverty alleviation.

• AARDO conducts capacity-building programs, training, and pilot projects to support rural development in member countries.

• India’s Contributions to AARDO:

• India has been an active participant in AARDO’s activities since its inception and has shared its expertise in areas like agriculture, rural technology, and rural entrepreneurship.

• The Indian government has hosted several training programs and workshops for AARDO member states to enhance their rural development strategies.

• India’s rural development initiatives, such as MGNREGA, Pradhan Mantri Gram Sadak Yojana, and PM-KISAN, serve as models for other member nations.

• Other Member Countries:

• Ghana: AARDO member country in Africa that actively participates in rural and agricultural development initiatives but is not the chair for 2025-27.

• Singapore: While not a major agricultural country, it contributes to knowledge-sharing and technical expertise within AARDO.

• Malaysia: A key AARDO member from Asia, focusing on rural technology and economic development, but not elected as the chair.

• Important Points:

• India’s leadership in AARDO is expected to strengthen south-south cooperation, enabling resource and knowledge sharing between Africa and Asia.

• The chair position allows India to address global rural challenges such as climate resilience, food security, and poverty reduction.

• India’s election as chair reflects its dedication to rural development and its growing international stature as a leader in sustainable development.

Q82. Answer: (b) Gujarat

The correct answer is Gujarat.

Key Points

• Gujarat released a draft child protection policy on 1 April 2025 to ensure the safety and well-being of children across the state.

• The policy aims to cover all institutions, including schools, childcare homes, and other child-centric facilities, ensuring a comprehensive framework for child protection.

• This draft policy focuses on addressing vulnerabilities faced by children, such as child abuse, trafficking, exploitation, and neglect.

• The Gujarat government invited public feedback on the draft to ensure inclusive participation and to tailor the policy in accordance with the needs of the community.

• This initiative aligns with India's commitment to child rights as per the United Nations Convention on the Rights of the Child (UNCRC), which India ratified in 1992.

Additional Information

• Key Highlights of the Draft Policy:

• The policy outlines measures to create a safe environment for children, both in institutions and within the community.

• It emphasizes the importance of mandatory child safety audits in schools and childcare institutions.

• The policy recommends the establishment of a dedicated Child Protection Unit in each district to oversee the implementation of child protection measures.

• Special provisions are included to address issues such as cyber safety, child labor, and child marriage.

• Child Protection Framework in India:

• The Juvenile Justice (Care and Protection of Children) Act, 2015, is the primary legislation for child protection in India, focusing on children in conflict with the law and children in need of care and protection.

• The Protection of Children from Sexual Offences (POCSO) Act, 2012, provides a robust framework for addressing child sexual abuse.

• The Integrated Child Protection Scheme (ICPS) is a central government initiative aimed at creating a safe environment for children.

• India’s commitment to UNCRC ensures that the rights of children are upheld in all policy initiatives.

• Child Protection Challenges in India:

• High prevalence of child labor, with millions of children engaged in hazardous occupations.

• Issues of child marriage, particularly in rural areas, despite being prohibited under the law.

• Growing concerns over cyber threats targeting children, including online abuse and exploitation.

• Limited access to resources for children from economically weaker sections.

• Important Initiatives by Gujarat:

• Gujarat has consistently been a frontrunner in implementing child welfare schemes, such as the Kanya Kelavani Scheme, to promote girl child education.

• The state government also focuses on reducing infant mortality and improving child healthcare through programs like Chiranjeevi Yojana.

• Special training programs for teachers and caregivers are regularly conducted to enhance their capacity to address child protection concerns.

Q83. Answer: (b) 3D bioprinting with stem cells

The correct answer is Stem Cells with 3D Bioprinting.

Key Points

• 3D Bioprinting is an advanced technology that uses layer-by-layer printing techniques to create complex biological structures, such as human tissues and organs.

• This approach uses stem cells as the primary material, which are capable of differentiating into specialized cell types, making them ideal for replicating human tissues.

• The technique is specifically beneficial for creating highly delicate and functional microstructures, such as lung tissues, which are crucial for research and transplantation purposes.

• 3D bioprinting of lung tissues involves hydrogel scaffolds, which mimic the extracellular matrix, providing structural support for the growth and organization of cells.

• This innovation contributes significantly to fields like personalized medicine, drug testing, and organ transplantation, reducing the dependency on donor organs.

Additional Information

• Stem Cells:

• These are unspecialized cells with the ability to develop into different cell types, such as muscle cells, brain cells, or lung cells.

• There are two main types: embryonic stem cells, which are pluripotent, and adult stem cells, which are multipotent and found in tissues like bone marrow.

• Stem cells are used in regenerative medicine to repair or replace damaged tissues and organs.

• 3D Bioprinting Process:

• It involves the use of bio-inks, which are composed of living cells and biomaterials, to print biological structures.

• The process includes three steps: pre-bioprinting (design and preparation), bioprinting (layer-by-layer deposition), and post-bioprinting (stabilization and maturation).

• It is widely used for creating organoids, skin grafts, and vascular structures.

• Applications of 3D Bioprinting:

• Medical Research: It helps in studying diseases like lung cancer by creating accurate tissue models.

• Drug Testing: Bioprinted tissues are used for testing drug efficacy and toxicity without the need for animal models.

• Transplantation: It offers a potential solution to the shortage of donor organs, enabling the creation of customized implants.

• Other Technologies Mentioned:

• AI-powered organoid modeling: While AI enhances organoid research, it does not involve direct tissue creation like 3D bioprinting.

• CRISPR Editing: Used for genetic modifications but not for building physical tissue structures.

• Quantum Protein Folding: This is a computational method for understanding protein structures and is unrelated to tissue fabrication.

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Q84. Answer: (b) Uttar Pradesh

The correct answer is Uttar Pradesh.

Key Points

• As per the India Government Report of July 2025, Uttar Pradesh emerged as the leading state in e-waste processing for the financial year 2024-25.

• Uttar Pradesh has developed significant infrastructure for e-waste management, including government-approved recycling

facilities and private sector participation.

• The state has also implemented robust awareness campaigns and compliance mechanisms to tackle e-waste issues efficiently.

• Policies under the E-Waste (Management) Rules, 2016 have been actively enforced in Uttar Pradesh, ensuring effective disposal and recycling of electronic waste.

• Efforts to engage manufacturers under the Extended Producer Responsibility (EPR) framework have boosted the collection and processing rates in the state.

Additional Information

• E-Waste Management in India:

• India is the third-largest producer of e-waste globally, generating approximately 3.23 million metric tonnes in 2022.

• The main contributors to e-waste are discarded computers, mobile phones, televisions, refrigerators, and washing machines.

• The E-Waste (Management) Rules, 2016, mandate proper collection, recycling, and disposal of e-waste, emphasizing the responsibilities of producers and consumers.

• Extended Producer Responsibility (EPR):

• EPR is a key feature of the E-Waste Rules, requiring producers to ensure proper disposal of their products post-consumer use.

• Producers are obligated to set up collection mechanisms such as take-back programs or drop-off centers.

• Uttar Pradesh's Initiatives in E-Waste Management:

• The state has established several e-waste collection centers in urban and semi-urban areas.

• Uttar Pradesh has partnered with private firms and non-governmental organizations to boost e-waste recycling.

• Educational programs and public campaigns have been rolled out to educate citizens on the importance of e-waste recycling.

• Other Leading States in E-Waste Management:

• Gujarat: Known for its industrial hubs and recycling facilities, Gujarat has made significant strides in e-waste processing.

• Kerala: The state has implemented innovative waste management programs and policies to handle e-waste efficiently.

• Madhya Pradesh: With growing awareness and infrastructure, the state has shown considerable improvement in managing e-waste.

Important Points

• Environmental Concerns of E-Waste:

• E-waste contains hazardous materials such as lead, mercury, and cadmium, which can contaminate soil and water if not disposed of properly.

• Improper processing, such as open burning and acid baths, releases toxic emissions, posing health risks to workers and nearby communities.

• Government Initiatives:

• The Digital India Initiative has indirectly contributed to increased e-waste production, prompting the need for robust management systems.

• The Swachh Bharat Abhiyan emphasizes waste segregation and recycling, including e-waste.

Q85. Answer: (d) Star Health and Allied Insurance

The correct answer is Star Health and Allied Insurance.

Key Points

• Star Health and Allied Insurance launched the 'SheTARA' health campaign on International Women's Day 2025, focusing on health awareness and empowerment for women.

• The campaign aims to address the specific health needs of women, such as maternal care, breast cancer awareness, and preventive healthcare.

• It is part of Star Health's initiative to promote gender inclusivity and create a platform for discussions on women's health challenges.

• Star Health and Allied Insurance is a prominent player in the health insurance sector in India, known for its specialized health insurance products.

• The campaign aligns with the company’s vision of strengthening women’s access to quality healthcare and insurance solutions.

Additional Information

• Star Health and Allied Insurance:

• Founded in 2006, it is one of India's first standalone health insurance providers.

• It offers various health insurance products such as family health plans, critical illness plans, senior citizen plans, and more.

• Known for its extensive network of hospitals and cashless treatment facilities, Star Health focuses on customer-centric services.

• International Women's Day:

• Celebrated annually on March 8, it highlights the achievements and challenges faced by women worldwide.

• The theme for International Women's Day 2025 is expected to focus on health equity and empowerment.
• Health Campaigns in India:
• Government and private organizations frequently launch campaigns to address public health challenges.
• Examples include initiatives for maternal health, cancer awareness, vaccination drives, and more.
• Importance of Women-Centric Health Campaigns:
• Women face unique health challenges due to biological and societal factors.
• Campaigns like 'SheTARA' aim to improve health outcomes and awareness among women.

Important Points

• Other Health Insurance Providers:
• HDFC ERGO General Insurance: Known for its diverse insurance products including health, motor, and travel insurance.
• United India Insurance Company: One of the oldest insurance companies offering a wide range of general insurance services.
• ICICI Lombard General Insurance: A leading private-sector insurer providing customized health and general insurance solutions.
• Significance of Women's Health Awareness:
• Improving women's health contributes to better family and community well-being.
• Focused campaigns help reduce gender disparities in healthcare access.

Q86. Answer: (a) Mission for Aatmanirbharta in Pulses

The correct answer is Mission for Aatmanirbharta in Pulses.

Key Points

• Mission for Aatmanirbharta in Pulses was launched by the Indian Prime Minister on 11 October 2025.
• The mission is aimed at achieving self-sufficiency in pulses production during the 2025-26 to 2030-31 period.
• A total of Rs. 11,440 crore has been allocated as the budgetary provision for this initiative.
• The mission focuses on boosting domestic production of pulses to reduce dependency on imports and ensure food security.
• This initiative aligns with the broader goal of the Aatmanirbhar Bharat Abhiyan, which emphasizes self-reliance in various sectors, including agriculture.

Additional Information

• Importance of Pulses in India:
• Pulses are a vital source of protein for a significant portion of the Indian population, especially vegetarians.
• India is the largest producer, consumer, and importer of pulses globally.
• The production of pulses plays a crucial role in addressing malnutrition and ensuring food security.
• Aatmanirbhar Bharat Abhiyan:
• Launched by the Government of India in 2020, it aims to make India self-reliant in various sectors.
• The mission emphasizes local production to boost the economy and reduce reliance on imports.
• Agriculture is one of the key focus areas under this initiative.
• Government Initiatives for Pulses:
• The National Food Security Mission (NFSM) includes a specific component for increasing pulses production.
• Various subsidies and schemes are provided to encourage farmers to cultivate pulses.
• Minimum Support Prices (MSP) are regularly revised to ensure fair prices for farmers.
• Global Context:
• India imports a significant quantity of pulses from countries like Canada, Myanmar, and Australia.
• Enhancing domestic production will help reduce import dependency and save foreign exchange.
• The United Nations declared 2016 as the International Year of Pulses to highlight their importance in sustainable agriculture and food security.

Important Points

• Pulses and Soil Health:
• Pulses are known for their ability to fix nitrogen in the soil, improving soil fertility and reducing the need for chemical fertilizers.
• Increased pulses cultivation contributes to sustainable agricultural practices.
• Challenges in Pulses Production:
• Erratic monsoons and climate change affect pulses yield significantly.
• Limited access to quality seeds and modern farming techniques among farmers.
• Price volatility and market uncertainties discourage farmers from cultivating pulses.

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Q87. Answer: (d) South Africa

The correct answer is South Africa.

Key Points

• G20 Foreign Ministers Meeting: The G20 comprises 19 countries and the European Union, representing the world's largest economies. The foreign ministers of these nations meet periodically to discuss global issues, including diplomacy, trade, and security.

• In March 2025, the meeting of the G20 Foreign Ministers is hosted by South Africa, one of the member countries of the G20 group.

• South Africa's Role in G20: South Africa is the only African country in the G20 and plays a pivotal role in representing the continent's interests on global platforms. This hosting opportunity underscores South Africa's significance in international diplomacy.

• Agenda of the Meeting: G20 Foreign Ministers' Meetings generally focus on issues like global economic recovery, climate change, sustainable development, and international security. South Africa's hosting likely emphasizes African concerns such as socio-economic development, health, and climate resilience.

• Previous G20 Meetings: The presidency of G20 rotates among member countries annually. South Africa hosting the foreign ministers' meeting highlights its active participation and leadership in global discussions.

Additional Information

• About G20:

• The Group of Twenty (G20) was established in 1999 as an international forum for governments and central bank governors from 19 countries and the European Union.

• It includes major economies such as the USA, China, India, Germany, Japan, and South Africa, among others, representing about 80% of the global GDP and 75% of international trade.

• The G20's objective is to address issues related to the global economy, such as financial stability, climate change, and sustainable development.

• South Africa's Membership:

• South Africa joined the G20 in 2008 and has consistently advocated for equitable global policies that benefit developing nations.

• As the only African member, South Africa often focuses on poverty alleviation, health systems strengthening, and climate adaptation in Africa.

• Importance of Hosting:

• Hosting a G20 meeting signifies a nation's ability to lead global conversations and showcases its diplomatic strength.

• For South Africa, this reinforces its position as a voice for developing countries and a leader in promoting regional cooperation within Africa.

• Recent G20 Presidency:

• The G20 presidency rotates annually among its members. Recent presidencies include India (2023), Indonesia (2022), and Italy (2021).

• South Africa's hosting of the foreign ministers' meeting aligns with its active role in global governance and economic discussions.

Important Points

• South Africa's Global Diplomacy:

• South Africa is a member of several international organizations, including BRICS, the African Union, and the United Nations.

• Its active diplomacy is aimed at fostering peace, security, and development on the African continent and globally.

• Key Agenda Items for Africa:

• As host, South Africa is likely to focus on issues such as poverty reduction, access to vaccines, climate resilience, and sustainable infrastructure.

• The meeting provides an opportunity to highlight Africa's developmental needs on a global platform.

• Global Economic Recovery:

• The G20 continues to address challenges posed by the COVID-19 pandemic, including vaccine distribution and economic recovery.

• South Africa's hosting emphasizes equitable solutions for developing countries.

Q88. Answer: (d) Arjun Ram Meghwal

The correct answer is Arjun Ram Meghwal.

Key Points

• The Union Minister of State for Law and Justice (Independent Charge), Arjun Ram Meghwal, inaugurated the 'Mahila Arogya Kaksha' (Women's Health Room) at Shastri Bhawan, New Delhi.

• The initiative was launched in July 2024 (referenced as 2025 in some contexts) to prioritize and promote the health and

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well-being of female employees working in various ministries and visitors.

• The 'Mahila Arogya Kaksha' is designed to provide a dedicated space for medical consultations, primary health check-ups, and preventive healthcare services specifically for women.

• This facility aims to address common health issues faced by women in the workplace, including maternal health, menstrual hygiene, and stress management, ensuring a supportive work environment.

• The inauguration reflects the Government of India's commitment to gender-sensitive infrastructure and the holistic empowerment of women in the workforce.

Additional Information

• Arjun Ram Meghwal:

• He is a prominent leader from Rajasthan and currently serves as the Minister of State (Independent Charge) for the Ministry of Law and Justice.

• He represents the Bikaner constituency in the Lok Sabha.

• In addition to Law, he has held portfolios in Parliamentary Affairs and Culture.

• Shastri Bhawan:

• Located in New Delhi, it is a major government building that houses several Union Ministries, including Education, Law and Justice, Information and Broadcasting, and Social Justice and Empowerment.

• It serves as a central hub for administrative operations of the Government of India.

• Women's Health Schemes in India:

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

• POSHAN Abhiyaan: Launched in 2018 to improve nutritional outcomes for children, pregnant women, and lactating mothers.

• Jan Aushadhi Suvidha: An initiative to provide oxobiodegradable sanitary napkins at a subsidized rate of Rs. 1 per pad through Pradhan Mantri Bhartiya Janaushadhi Kendras.

Important Points

• Constitutional Context:

• Article 42 of the Constitution of India directs the State to make provisions for securing just and humane conditions of work and for maternity relief.

• The establishment of facilities like the Mahila Arogya Kaksha aligns with the Directive Principles of State Policy (DPSP).

• Significance of Workplace Wellness:

• According to various health surveys, dedicated medical rooms in offices increase productivity and reduce absenteeism among women employees by providing immediate first-aid and health counseling.

• This initiative is a step towards achieving Sustainable Development Goal (SDG) 3 (Good Health and Well-being) and SDG 5 (Gender Equality).

Q89. Answer: (c) Ravichandran Ashwin

The correct answer is Ravichandran Ashwin.

Key Points

• Padma Shri is the fourth-highest civilian award in India, instituted in 1954. It is awarded for distinguished contributions in various fields such as arts, sports, literature, social work, public service, and science.

• Indian cricketer Ravichandran Ashwin was honored with the Padma Shri award in 2025 for his exceptional contribution to Indian cricket and his remarkable achievements on the international stage.

• Ravichandran Ashwin is a renowned Indian off-spinner and all-rounder who has been instrumental in winning several matches for India, especially in Test cricket. He is known for his outstanding bowling skills and strategic gameplay.

• As of 2025, Ashwin holds records such as being one of the fastest bowlers to reach 400 Test wickets, showcasing his consistency and dominance in the sport.

• His contribution to cricket has earned him recognition as one of the finest cricketers in the history of Indian cricket, leading to this prestigious award.

Additional Information

• About Ravichandran Ashwin:

• Born on 17 September 1986 in Chennai, Tamil Nadu, Ashwin is a right-arm off-spin bowler and a right-handed batsman.

• He made his international debut for India in 2010 and has been a vital part of the Indian cricket team across formats.

• Ashwin is known for his versatility and ability to bowl variations, which makes him one of the most successful bowlers in the modern era.

• He has won several accolades, including the ICC Cricketer of the Year award in 2016.

• Other Indian Cricketers Awarded Padma Shri:

• Kapil Dev: Awarded Padma Shri in 1983 after leading India to their first Cricket World Cup victory.
• Sachin Tendulkar: Received Padma Shri in 1999 for his extraordinary achievements in cricket.
• Virat Kohli: Honored with Padma Shri in 2017 for his contributions as a batsman and captain.
• Importance of Padma Awards:
• The Padma Awards—Padma Shri, Padma Bhushan, and Padma Vibhushan—are India's civilian honors presented annually by the Government of India.
• They aim to recognize individuals who have made exceptional contributions to their respective fields.
• These awards are presented by the President of India at ceremonial functions held at Rashtrapati Bhavan.
• Criteria for Padma Shri:
• The award celebrates achievements in fields like sports, education, medicine, literature, arts, and social service.
• Nominees are selected based on their impact, contribution, and dedication to their domain.
• Recommendations are made by the Padma Awards Committee and approved by the Prime Minister and President of India.

Important Points

• Padma Shri Recipients in Sports:
• Several athletes have been honored with Padma Shri, including P.V. Sindhu (badminton), Mary Kom (boxing), and Leander Paes (tennis).
• Recognizing sports personalities underlines the importance of sports in fostering national pride and unity.
• Procedure for Nomination:
• Nominees for Padma Awards can be suggested by individuals, institutions, or state governments.
• The final selection is made by the Padma Awards Committee after thorough deliberation.

Q90. Answer: (a) SHAKTI

The correct answer is SHAKTI.

Key Points

• The IRIS chip is a specialized microprocessor developed through a collaborative effort between the Indian Institute of Technology (IIT) Madras and the Indian Space Research Organisation (ISRO).
• This chip is fundamentally based on the SHAKTI microprocessor architecture, which is India's first indigenous RISC-V based processor family.
• The SHAKTI project was initiated by the RISE group at IIT Madras with the primary objective of creating a home-grown ecosystem for microprocessor design to achieve self-reliance in electronics and computing.
• The development of the IRIS chip specifically caters to the stringent requirements of space-grade applications, including on-board processing for satellites and launch vehicles where reliability and radiation hardness are critical factors.
• By using the SHAKTI architecture, the IRIS chip leverages an open-source instruction set, ensuring that India has complete control over the design and security of the hardware, which is vital for national security and strategic sectors.

Additional Information

• SHAKTI Microprocessor Program: Launched as a part of the Digital India initiative, it aims to build a suite of processors ranging from IoT (Internet of Things) devices to high-performance computing (HPC) clusters. The project is supported by the Ministry of Electronics and Information Technology (MeitY), Government of India.
• Microprocessor Development Programme (MDP): Under this umbrella, India has developed several indigenous processors like SHAKTI (by IIT Madras), VEGA (by C-DAC), and AJIT (by IIT Bombay). These are designed to replace foreign architectures like ARM Cortex, Intel x86, and MIPS in sensitive sectors.
• RISC-V Architecture: Unlike proprietary architectures like Intel x86 or ARM, RISC-V is an open-standard instruction set architecture (ISA). It allows researchers and companies to design chips without paying licensing fees, making it an ideal choice for indigenous research and development.
• ARM Cortex and Intel x86: These are globally dominant but proprietary architectures. ARM (a United Kingdom based company) and Intel (a United States based company) designs are widely used in smartphones and laptops, but they pose risks related to hardware backdoors and supply chain disruptions for strategic Indian projects.
• Applications of Indigenous Chips: These chips find applications in smart meters, defense systems, automotive electronics, and telecommunications. Using SHAKTI based chips like IRIS helps in reducing the import bill for electronic components.

Important Points

• In 2018, IIT Madras successfully booted the first SHAKTI processor, named RISE, which was fabricated at the ISRO Semi-Conductor Laboratory (SCL) in Chandigarh.
• The IRIS chip represents a significant milestone in the Atmanirbhar Bharat (Self-Reliant India) mission, specifically in the semiconductor domain.
• The ISRO-IIT Madras partnership ensures that the microprocessors are optimized for low-power consumption and high-speed

data handling, which are essential for remote sensing and navigation satellites like NavIC.

• The SHAKTI architecture is coded using Bluespec System Verilog, a high-level hardware description language, which enhances the efficiency of the chip design process.

Q91. Answer: (c) 130th

The correct answer is 134th.

Key Points

• According to the Human Development Report (HDR) 2023/24 released by the United Nations Development Programme (UNDP), India secured the 134th rank among 193 countries. This reflects a slight improvement in its Human Development Index (HDI) value. Hence, the correct option is 134th.

• India's HDI value increased to 0.644 in 2022, up from 0.633 in 2021. This score places India in the 'Medium Human Development' category, showing progress after a brief decline during the COVID-19 pandemic years.

• The 2023/24 report is titled "Breaking the Gridlock: Reimagining Cooperation in a Polarized World." It highlights that while global HDI reached a record high in 2023, the gap between the richest and poorest nations is widening due to political polarization and geopolitical tensions.

• The report notes significant improvements in India's performance across all key indicators, including life expectancy, education, and Gross National Income (GNI) per capita, which contributed to the rise in its global standing compared to the previous 135th rank.

• In the regional context, India ranks higher than some of its neighbors like Pakistan (164th) and Myanmar (144th), but remains behind Sri Lanka (78th) and China (75th) in the human development hierarchy.

Additional Information

• Dimensions of HDI: The Human Development Index (HDI) is a composite index that measures average achievement in three basic dimensions of human development:

• A long and healthy life: Measured by Life Expectancy at Birth. In India, this increased from 62.7 years to 67.7 years according to recent data.

• Knowledge: Measured by Mean Years of Schooling (for adults aged 25 years and older) and Expected Years of Schooling (for children of school entering age). India’s expected years of schooling stood at 12.6 years.

• A decent standard of living: Measured by Gross National Income (GNI) per capita based on Purchasing Power Parity (PPP). India’s GNI per capita increased to $6,951.

• Gender Inequality Index (GII): In the same report, India stood at the 108th rank out of 193 countries with a score of 0.437. This index measures gender inequalities in reproductive health, empowerment, and labor market participation.

• Global Rankings: In the 2023/24 report, Switzerland maintained its position at rank 1, followed by Norway and Iceland. These countries are categorized under 'Very High Human Development'.

• United Nations Development Programme (UNDP): It was established in 1965 by the United Nations General Assembly. Headquartered in New York City, it is the UN's global development network, focusing on poverty reduction, HIV/AIDS, democratic governance, and environmental sustainability.

Important Points

• The HDI was created by Pakistani economist Mahbub ul Haq and Indian economist Amartya Sen in 1990 to emphasize that people and their capabilities should be the ultimate criteria for assessing the development of a country.

• The index ranges from 0 to 1. A value closer to 1 indicates a higher level of human development. India's shift to 0.644 reflects a steady upward trajectory since 1990, when its value was approximately 0.434.

• Government Initiatives: India’s improvement is often attributed to large-scale missions such as Swachh Bharat Abhiyan (sanitation), Pradhan Mantri Ujjwala Yojana (clean energy), and Ayushman Bharat (health insurance), which directly impact the HDI components.

Q92. Answer: (b) Central Bureau of Investigation

The correct answer is Central Bureau of Investigation.

Key Points

• The Central Bureau of Investigation (CBI) launched Bharatpol in January 2025 to streamline real-time communication between Indian law enforcement agencies and Interpol.

• Bharatpol is a state-of-the-art platform designed to enhance coordination and efficiency in handling international crime-related matters.

• It enables secure and instant data sharing among Indian agencies, facilitating better collaboration in cross-border investigations.

• As the national central bureau for Interpol in India, the CBI is responsible for liaising with Interpol's General Secretariat and member countries.

• This initiative aligns with the government's focus on leveraging technology to combat transnational organized crime, terrorism, and other global threats effectively.

Additional Information

• Central Bureau of Investigation (CBI):

• The CBI was established in 1941 as the Special Police Establishment and renamed as Central Bureau of Investigation in 1963.

• It operates under the Ministry of Personnel, Public Grievances, and Pensions of the Government of India.

• The CBI is tasked with investigating high-profile cases, including corruption, economic offenses, and serious crimes.

• Its role as the national central bureau for Interpol allows it to coordinate international investigations and issue Red Notices for fugitives.

• Interpol:

• Interpol, or the International Criminal Police Organization, was founded in 1923 and has its headquarters in Lyon, France.

• It facilitates cooperation among 194 member countries to combat international crime.

• India has been a member of Interpol since 1949, with the CBI acting as its representative.

• Key functions of Interpol include issuing Red Notices for wanted individuals and providing databases for international crime-related information.

• Technology in Crime Prevention:

• The launch of Bharatpol reflects India's emphasis on leveraging technology to combat transnational crimes and improve investigative processes.

• Technological platforms like Bharatpol enhance data security, speed, and accuracy in law enforcement communication.

• Similar initiatives include the Crime and Criminal Tracking Network and Systems (CCTNS), aimed at creating a comprehensive database of crimes and criminals in India.

• The use of technology aligns with global trends for improving the efficiency of law enforcement agencies.

• Important Developments in Indian Law Enforcement:

• The CBI has been instrumental in handling high-profile cases, including corruption scandals like the 2G spectrum case and the coal allocation scam.

• It has played a crucial role in combating international cybercrime and tracking fugitives through its Interpol coordination.

• India's technological advancements in law enforcement aim to address challenges posed by globalization and digitalization.

• Other initiatives like the National Intelligence Grid (NATGRID) and the Integrated Criminal Justice System (ICJS) complement Bharatpol's objectives.

Important Points

• Red Notices: These are requests issued by Interpol to locate and provisionally arrest individuals pending extradition. Bharatpol is expected to streamline the process of issuing and responding to such notices.

• Data Security: Bharatpol ensures secure communication channels to prevent sensitive information from being compromised during international investigations.

• Collaboration: It fosters collaboration among Indian agencies, improving coordination in handling cases with international dimensions.

• Global Trends: The adoption of technology in law enforcement aligns with global practices for combating transnational organized crime and terrorism.

• Capacity Building: Bharatpol also aims to enhance the capacity of Indian agencies to deal with sophisticated criminal networks effectively.

Q93. Answer: (a) Budapest, Hungary

The solution is in Hindi. Read it online.

Q94. Answer: (d) Reserve Bank of India

The correct answer is Reserve Bank of India.

Key Points

• Reserve Bank of India (RBI) launched a WhatsApp Channel in April 2025 to provide verified updates and information related to financial services, regulations, and initiatives.

• The WhatsApp Channel aims to enhance communication with the public by delivering authentic and real-time updates directly to users through a platform widely used in India.

• This initiative is part of RBI's broader goal to increase financial literacy and awareness among citizens, ensuring they stay informed about monetary policies and regulations.

• The channel is expected to share updates on key financial initiatives, including changes in interest rates, new schemes, and guidelines for secure digital transactions.

• By using WhatsApp, a platform with over 400 million users in India, RBI ensures that the information is accessible to a large audience, including those in rural and semi-urban areas.

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Additional Information

• Reserve Bank of India (RBI):

• The Reserve Bank of India is the central bank of India, established on 1 April 1935, under the RBI Act, 1934.

• It regulates the issuance and supply of the Indian rupee and oversees the banking system in the country.

• Headquartered in Mumbai, its primary functions include managing monetary policy, issuing currency, and maintaining financial stability.

• WhatsApp as an Information Platform:

• WhatsApp is a widely-used messaging platform with over 2 billion users globally, and more than 400 million users in India.

• Its user-friendly interface makes it an effective tool for organizations to share updates with a large audience in real-time.

• Features such as end-to-end encryption ensure that the information shared is secure and reliable.

• Financial Literacy Initiatives by RBI:

• RBI has launched several programs to promote financial literacy, including the Financial Literacy Week, which focuses on themes like digital payments and credit discipline.

• It also runs Rural Financial Literacy Centers to educate people in remote areas about banking and financial services.

• Significance of Verified Financial Updates:

• Providing authentic and verified information helps prevent the spread of misinformation, especially in a digital age where fraudulent activities are prevalent.

• It ensures that citizens make informed decisions related to investments, savings, and other financial matters.

Important Points

• Other RBI Digital Initiatives:

• The RBI Digital Payments Awareness Campaign focuses on promoting secure and convenient digital payments.

• The RBI Retail Direct Scheme enables retail investors to directly invest in government securities.

• Global Examples of Central Banks Using Technology:

• The Federal Reserve in the US uses social media platforms to share updates on monetary policy decisions.

• The Bank of England has an active presence on digital platforms to engage with the public and disseminate financial information.

Q95. Answer: (c) 10th

The solution is in Hindi. Read it online.

Q96. Answer: (d) Jannik Sinner

The correct answer is Jannik Sinner.

Key Points

• Jannik Sinner, an Italian professional tennis player, won the 2025 Australian Open Men’s Singles title, marking a significant milestone in his career.

• Sinner defeated some of the top-ranked players in the tournament, showcasing exceptional skill, endurance, and composure throughout the event.

• This victory represents Sinner's first Grand Slam title, solidifying his place among the elite players in professional tennis.

• The final match was an intense encounter, where Sinner demonstrated remarkable baseline play, powerful groundstrokes, and precise serving to claim the championship.

• His victory is a testament to his consistent performance and rapid rise in the ATP rankings, making him one of the most promising young stars in tennis.

Additional Information

• Jannik Sinner:

• Born: August 16, 2001, in San Candido, Italy.

• Playing Style: Sinner is known for his aggressive baseline play, powerful forehand, and strong backhand strokes.

• Achievements: Before winning the 2025 Australian Open, Sinner had already secured multiple ATP titles and reached the latter stages of several Grand Slam tournaments.

• He is one of the youngest players to break into the ATP Top 10 rankings, a testament to his immense talent and potential.

• 2025 Australian Open:

• The Australian Open is the first Grand Slam tournament of the year and is held annually in Melbourne, Australia.

• The 2025 tournament featured top players like Novak Djokovic, Carlos Alcaraz, Daniil Medvedev, and Jannik Sinner.

• It is played on hard courts and is known for its high-intensity matches and extreme weather conditions.

• The Australian Open is part of the Grand Slam series, which also includes Wimbledon, the French Open, and the US Open.

• Other Competitors:

• Novak Djokovic: A Serbian tennis legend with numerous Grand Slam titles. Despite his dominance, he was unable to secure the 2025 Australian Open title.
• Carlos Alcaraz: A Spanish prodigy and a rising star in tennis, known for his versatility and athleticism.
• Daniil Medvedev: A Russian player recognized for his unique playing style and tactical intelligence.
• These competitors pushed Sinner to his limits, making his victory even more significant.
• Key Features of the Australian Open:
• The tournament is played at the Melbourne Park complex, featuring iconic courts like the Rod Laver Arena.
• The use of advanced technology, including Hawk-Eye Live, ensures accurate line calls.
• The Australian Open is also known for its night matches, which add an extra layer of excitement for fans.

Important Points

• Grand Slam Tournaments:
• The four major Grand Slam tournaments are the Australian Open, French Open, Wimbledon, and US Open.
• Winning a Grand Slam is considered one of the highest achievements in professional tennis.
• ATP Rankings:
• The Association of Tennis Professionals (ATP) ranks players based on their performance in tournaments over the past year.
• Jannik Sinner's victory at the Australian Open is expected to boost his ATP ranking significantly.

Q97. Answer: (c) Cyclone Man of India

The correct answer is Cyclone Man of India.

Key Points

• The Sasakawa Award for Disaster Risk Reduction is a prestigious recognition granted by the United Nations Office for Disaster Risk Reduction (UNDRR) to individuals and organizations for their outstanding contributions to disaster risk management and mitigation efforts globally.
• Mritunjay Mohapatra, popularly known as the Cyclone Man of India, is associated with accurate predictions and effective disaster risk reduction strategies, particularly in the context of cyclonic storms in the Indian region.
• He serves as the Director General of the India Meteorological Department (IMD), which plays a crucial role in forecasting and issuing early warnings for cyclones, saving countless lives.
• Mohapatra's work in improving cyclone forecasting systems, including the use of advanced technology and satellite data, has earned him significant recognition in disaster risk reduction on both national and international levels.
• The Sasakawa Award 2025 highlights his contributions to disaster preparedness, mitigation, and climate resilience, showcasing India's advancements in weather forecasting and disaster management.

Additional Information

• India Meteorological Department (IMD):
• The IMD was established in 1875, making it one of the oldest meteorological organizations globally.
• It is headquartered in New Delhi and functions under the Ministry of Earth Sciences, Government of India.
• The IMD specializes in weather forecasting, cyclone tracking, monsoon prediction, and disaster management, using state-of-the-art technologies such as Doppler radar systems and satellite data.
• Cyclones in India:
• India is vulnerable to tropical cyclones due to its extensive coastline spanning over 7,500 km.
• Most cyclones affecting India originate in the Bay of Bengal, and states like Odisha, Andhra Pradesh, and West Bengal experience significant impacts.
• IMD plays a pivotal role in issuing warnings and minimizing the loss of life and property during cyclonic events.
• Sasakawa Award:
• Established in 1986, the Sasakawa Award is administered by UNDRR and supported by the Nippon Foundation of Japan.
• The award recognizes individuals, organizations, and initiatives that demonstrate exemplary efforts in disaster risk reduction and resilience building.
• Recipients of the award are chosen based on their innovative approaches, community engagement, and measurable impact in disaster preparedness.
• Key Achievements of Mritunjay Mohapatra:
• As the Cyclone Man of India, Mohapatra has enhanced IMD's capabilities in tracking and predicting cyclones with precision.
• His leadership has contributed to minimizing the loss of life during cyclonic events through timely forecasts and effective communication strategies.
• He has been instrumental in promoting awareness about disaster preparedness and building resilience within vulnerable communities.

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Important Points

• Technological Advancements in Cyclone Forecasting:

• The IMD uses advanced tools such as Global Forecasting Systems (GFS), Weather Research and Forecasting (WRF) models, and Dynamical Ocean Atmospheric Model (DOAM) for accurate cyclone predictions.

• Doppler Weather Radars installed across coastal regions of India help in real-time monitoring of cyclonic storms.

• Satellite systems like INSAT-3D and INSAT-3DR contribute to enhanced forecasting capabilities.

• Community-Based Disaster Preparedness:

• Mohapatra's efforts emphasize the importance of engaging local communities in disaster risk reduction.

• Training programs and awareness campaigns conducted by IMD have empowered people to respond effectively to cyclonic warnings.

• Collaborations with state governments and NGOs have strengthened India's disaster management framework.

• Global Recognition:

• Mritunjay Mohapatra's contributions have earned him global recognition, making India a leader in disaster risk reduction.

• His achievements align with the goals of the Sendai Framework for Disaster Risk Reduction (2015–2030), which emphasizes reducing disaster risks through strategic planning and resilience building.

Q98. Answer: (d) Chennai

The correct answer is Chennai.

Key Points

• The First ASEAN-India Cruise Dialogue was hosted by the city of Chennai, Tamil Nadu, on 1 July 2025.

• This event aimed at strengthening maritime cooperation between ASEAN member states and India.

• Chennai was chosen as the host city due to its strategic location on the eastern coast of India and its historical ties with maritime trade and cultural exchanges.

• The dialogue focused on enhancing tourism, trade, and connectivity within the region, leveraging maritime routes and cruise tourism potential.

• It showcased India's commitment to fostering closer ties with the ASEAN region under the framework of Act East Policy.

Additional Information

• ASEAN-India Relations:

• ASEAN stands for the Association of Southeast Asian Nations, which includes 10 member states: Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Vietnam, Laos, Myanmar, and Cambodia.

• India became a dialogue partner of ASEAN in 1992 and elevated its relationship to a strategic partnership in 2012.

• The partnership focuses on areas such as trade, investment, connectivity, culture, and maritime security.

• Maritime Connectivity:

• Maritime connectivity is a key component of India's Act East Policy, which aims to strengthen ties with Southeast Asia.

• The development of cruise tourism is part of efforts to boost economic growth, cultural exchange, and regional cooperation.

• Chennai Port plays a vital role in facilitating maritime trade and cruise tourism in the region.

• Act East Policy:

• India's Act East Policy, launched in 2014, seeks to deepen engagement with ASEAN and other East Asian countries.

• It emphasizes trade, strategic cooperation, and connectivity across land, air, and sea routes.

• The policy aligns with India's broader vision of creating a free, open, and inclusive Indo-Pacific region.

• Chennai Port:

• Chennai Port is one of the largest and most important ports in India, strategically located on the eastern coast.

• The port has modern facilities to host international cruise ships and supports tourism and trade.

• Its proximity to cultural and heritage sites makes it an attractive destination for cruise tourism.

Important Points

• Benefits of Cruise Tourism:

• Economic growth: Cruise tourism contributes to local economies by creating jobs and increasing revenue.

• Cultural exchange: It promotes interaction between different cultures, fostering mutual understanding and cooperation.

• Sustainability: Governments and organizations are increasingly focusing on eco-friendly practices to ensure sustainable tourism.

• ASEAN-India Cooperation:

• Trade and investment: India and ASEAN countries have strong trade ties, with the ASEAN-India Free Trade Agreement facilitating economic exchange.

• Security: Collaborative efforts in maritime security ensure safe trade routes and counter piracy in the region.

• Cultural initiatives: Events like the ASEAN-India Cruise Dialogue highlight shared heritage and cultural ties.

Q99. Answer: (a) Eleven

The correct answer is Eleven years.

Key Points

• Narendra Modi became the Prime Minister of India on May 26, 2014, after leading the Bharatiya Janata Party (BJP) to a landslide victory in the general elections.

• By May 2025, Narendra Modi will have completed a total of eleven years as the Prime Minister of India.

• His first term spanned from May 2014 to May 2019, followed by his second term which began in May 2019.

• During his tenure, Narendra Modi has implemented various landmark policies and schemes such as Swachh Bharat Abhiyan, Ayushman Bharat, and Digital India, which have had a significant impact on the country's socio-economic landscape.

• May 2025 marks the completion of 11 years since Narendra Modi assumed office as Prime Minister of India.

Additional Information

• Timeline of Narendra Modi's Political Journey:

• Before becoming Prime Minister, Narendra Modi served as the Chief Minister of Gujarat from October 2001 to May 2014.

• He led the BJP to a historic victory in the 2014 General Elections, securing a majority with 282 seats in the Lok Sabha.

• In 2019 General Elections, under his leadership, BJP won 303 seats, further solidifying his position as India's Prime Minister.

• Key Policies Introduced During His Tenure:

• Swachh Bharat Abhiyan: Launched in 2014, this campaign aimed to eliminate open defecation and improve solid waste management across India.

• Ayushman Bharat: Introduced in 2018, it is the world's largest government-funded healthcare program, providing health coverage to over 10 crore families.

• Digital India: Initiated in 2015, it aims to transform India into a digitally empowered society and knowledge economy.

• Make in India: Launched in 2014, this initiative aimed to encourage companies to manufacture their products in India and boost domestic production.

• Atmanirbhar Bharat: This program, initiated during the COVID-19 pandemic, focuses on self-reliance and boosting the domestic economy.

• Election Victories:

• In 2014, Narendra Modi led BJP to its first majority win in 30 years, marking a significant shift in Indian politics.

• In 2019, his leadership saw BJP surpass its previous record, securing 303 seats and forming a strong government.

• Impact of Leadership:

• Under Modi’s leadership, India has seen significant reforms in areas like infrastructure, economy, and foreign policy.

• His government has focused on the themes of development, nationalism, and poverty alleviation.

• He has strengthened India's global position through active diplomacy and participation in international forums like the G20, BRICS, and Quad.

Important Points

• Prime Minister’s Designation: The Prime Minister of India is the head of the government and is appointed by the President of India. The tenure is typically five years, but can be extended if re-elected.

• Tenure Calculation: Narendra Modi’s tenure is calculated from May 26, 2014, the day he took oath as the Prime Minister, to May 2025, marking the completion of 11 years.

• Key Achievements: His tenure has been marked by a focus on economic reforms, technological development, and social welfare schemes.

• Global Recognition: Narendra Modi has been recognized internationally for his leadership and policies, receiving awards like the Champions of the Earth Award from the United Nations.

Q100. Answer: (c) Pranati Nayak

The solution is in Hindi. Read it online.

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