RRB Group D Official Paper (Held On: 02 Dec, 2025 Shift 3) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. Which of the following will NOT show Tyndal effect?

(a) Emulsion
(b) Milk
(c) Copper sulphate solution
(d) Starch

Q2. How does the sound of a patient’s heartbeat reach the doctor’s ears through a stethoscope?

(a) The sound travels directly through the stethoscope without any reflection.
(b) The stethoscope uses electricity to amplify the heartbeat sound.
(c) The sound is carried by moving air from the chest to the doctor’s ears.
(d) In stethoscopes, the sound of the patient’s heartbeat reaches the doctor’s ears by multiple reflection of sound.

Q3. The following vehicles are all moving at a velocity of 50 km/hr. All the vehicles need to be stopped at the same point. Which vehicle has to apply more force in breaks to stop the vehicle?

(a) Bus
(b) Bicycle
(c) Car
(d) Scooter

Q4. Which of the following groups is most at risk of HIV infections?

(a) People who maintain personal hygiene
(b) Individuals who have multiple unprotected sexual partners
(c) People who do not exercise regularly
(d) People who exercise regularly

Q5. Which of the following is the most common simple permanent tissue in plants?

(a) Sclerenchyma
(b) Aerenchyma
(c) Chlorenchyma
(d) Parenchyma

Q6. Apiaries help us in the production of which of the following food materials?

(a) Poultry egg
(b) Fish
(c) Honey
(d) Milk

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Q7. What is the motion of an object called when it travels along a circular path at a constant speed?

(a) Non-linear motion
(b) Uniform circular motion
(c) Linear motion
(d) Non-uniform circular motion

Q8. Which of the following properties makes ethanol a better alternative fuel compared to petrol?

(a) Ethanol is a solid fuel
(b) Ethanol has a higher boiling point than petrol
(c) Ethanol burns with a clean, smokeless flame
(d) Ethanol produces harmful smoke when burned

Q9. What is the molecular mass of glucose? (C = 12 u, H = 1 u, O = 16 u)

(a) 150 u
(b) 180 u
(c) 120 u
(d) 160 u

Q10. Over-secretion of growth hormone in adults results in which of the following?

(a) Acromegaly
(b) Graves' disease
(c) Addison's disease
(d) Dwarfism

Q11. Which of the following statements is correct about the image formed by a convex mirror?

(a) Magnified image
(b) Virtual and erect image
(c) Real and inverted image
(d) Real and erect image

Q12. The _____ ores are converted to their respective oxides by the process of roasting.

(a) carbonate
(b) sulphite
(c) chloride
(d) sulphide

Q13. Which of the following is a chemical property?

(a) Boiling point
(b) Melting point
(c) Fluidity
(d) Burning in air

Q14. In which of the following forms of reproduction, both sexes, males and females are needed to produce new generations?

(a) Budding
(b) Spore formation
(c) Sexual reproduction
(d) Fragmentation

Q15. Which of the following statements about movement is INCORRECT?

(a) Growth-related movement in plants, like bending toward light, is a form of movement.
(b) Living organisms show internal or molecular movement, even when external movement is not visible.
(c) Molecular movement is only found in animals, not plants.
(d) Movement is a characteristic of living organisms.

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Q16. When a person looks at a nearby object, the ciliary muscles:

(a) Contract and make the lens thicker
(b) Relax and make the lens thicker
(c) Contract and make the lens thinner
(d) Relax and make the lens thinner

Q17. A white solid reacts with dilute HCl, producing a gas that turns lime water milky. What can be definitely concluded?

(a) The gas is carbon dioxide; the solid is either a carbonate or bicarbonate.
(b) The solid is calcium carbonate.
(c) The solid is a metal carbonate, releasing carbon dioxide.
(d) The gas is hydrogen, indicating a reactive metal.

Q18. Which of the following is formed by each step of the food chain?

(a) Trophic level
(b) Stratosphere level
(c) Troposphere level
(d) Ozone layer

Q19. The kinetic energy of a body of mass m moving with a velocity v m/s is 'X' J. If the velocity of the body changes to 4v m/s, what will be the value of kinetic energy?

(a) 16X J
(b) 8X J
(c) 4X J
(d) 2X J

Q20. The covalent bonding behaviour of the carbon compounds corresponds to which of the following characteristics of these compounds?

(a) Low boiling point
(b) Both low melting and boiling point
(c) Low melting point
(d) High conductance

Q21. Which statement is INCORRECT about fragmentation (asexual reproduction)?

(a) Spore formation is a type of fragmentation process
(b) Produces genetically identical offspring
(c) Occurs in multicellular organisms
(d) Involves maturation before splitting

Q22. What is the chemical formula of baking soda?

(a) NaCl
(b) $NaHCO_3$
(c) Na_2CO_3
(d) NaOH

Q23. If a device is rated 90 W at 120 V, the current drawn is _____.

(a) 1.50 A
(b) 0.75 A
(c) 1.33 A
(d) 0.25 A

Q24. If the mass of the moon is doubled while keeping the distance between Earth and the moon constant, the gravitational force between Earth and the moon would:

(a) Half
(b) Remain the same
(c) Double

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(d) Become zero

Q25. A cube of side a is made of a material of resistivity ρ. What will be the resistance between two opposite faces of the cube?

(a) ρ a
(b) 2ρ a
(c) ρ/a²
(d) ρ/a

MATHEMATICS

Q26. A dealer marks his goods at 30% above the cost price and allows a discount of 38% on the marked price. What is his loss percentage?

(a) 18.6%
(b) 19.4%
(c) 21.3%
(d) 22.9%

Q27. If cos θ = 8/17, what is the value of sin θ?

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

Q28. Find the value of x, if 17 × 684 ÷ 57 - 5over7 of 4.2 = x + 13 × 204 ÷ 17

(a) 45
(b) 48
(c) 42
(d) 54

Q29. What is the average speed of a truck that covers half the distance at the speed of 20 km/hr and the other half at the speed of 80 km/hr?

(a) 32 km/hr
(b) 41 km/hr
(c) 40 km/hr
(d) 37 km/hr

Q30. A and B working together can do a piece of work in 5 days. B alone can do the same work in 55 days. How long (in days) will A alone take to do double the work?

(a) 14
(b) 11
(c) 12
(d) 5.5

Q31. The sum of the present ages of father and son is 96. 20 years ago, the father was three times as old as his son. What is the ratio of the present ages of the father and his son?

(a) 31 : 16
(b) 32 : 15
(c) 31 : 17
(d) 32 : 17

Q32. If x = -15, y = 25 and z = -10, then find the value of $x^3 + y^3 + z^3$.

(a) 12250
(b) 10250
(c) 11250

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(d) 13250

Q33. In a bag containing teal, maroon, and lime tokens, the ratio of teal to maroon tokens was 15 : 10, while the ratio of lime to teal tokens was 19 : 11. What was the ratio of lime to maroon tokens?

(a) 57 : 22
(b) 63 : 29
(c) 49 : 16
(d) 64 : 23

Q34. Which of the following sets of numbers can form the sides of a triangle?

(a) {10 cm, 8 cm, 2 cm}
(b) {8 cm, 9 cm, 4 cm}
(c) {9 cm, 12 cm, 22 cm}
(d) {5 cm, 6 cm, 11 cm}

Q35. A manufacturer sells an article to a wholesaler at a profit of 20%. The wholesaler then sells it to a retailer at a profit of 25%, and the retailer sells it to a customer at a profit of 24%. If the retailer's selling price is Rs. 372, what was the manufacturing cost of the article?

(a) Rs. 120
(b) Rs. 200
(c) Rs. 100
(d) Rs. 172

Q36. A store is offering 'Buy 47, get 9 free' on household items. What is the net percentage discount (approximately) being offered by the store?

(a) 17.75%
(b) 13.81%
(c) 19.02%
(d) 16.07%

Q37. A skilled worker earns Rs. 100 per day and an unskilled worker earns Rs. 50. If 5 workers earn Rs. 400 together in one day, how many skilled workers were there?

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

Q38. Subtracting 1% of X from X is the same as multiplying X by:

(a) 0.5
(b) 0.001
(c) 0.01
(d) 0.99

Q39. Three pipes, X, Y, and Z, can fill a tanker in 360 minutes, 540 minutes, and 720 minutes, respectively. Y and Z are opened for 30 minutes, then X is also opened. The time taken by the three pipes together to fill the remaining part of the tank is:

(a) 155 minutes
(b) 152 minutes
(c) 150 minutes
(d) 158 minutes

Q40. The average of 6.5, 10.6, 19.7 and a is 13. The value of a is:

(a) 17.2
(b) 16.2
(c) 15.2
(d) 14.2

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Q41. The sum of the first 5 prime numbers is:2635

(a) 27
(b) 32
(c) 28
(d) 26

Q42. Two trains having lengths of 410 m and 440 m are running at speeds of 130 km/hr and 140 km/hr, respectively, in the same direction. The time taken (in minutes) by the faster train, coming from behind, to completely cross the other train is:3385

(a) 5.1
(b) 8.1
(c) 14.7
(d) 6

Q43. The average age of 26 students of a class is 37 years. If the age of the teacher is also included, the average age of the whole group becomes 38 years. The age (in years) of the teacher is:

(a) 64
(b) 65
(c) 62
(d) 61

Q44. The length, breadth and height of a cuboid are in the ratio 6 : 5 : 3. If the volume of the cuboid is 720 m^3, find its surface area (in m^2).

(a) 458
(b) 504
(c) 424
(d) 360

Q45. Vinod, Kajal and Arpit invest Rs. 1,040, Rs. 1,390 and Rs. 1,890, respectively, to start a business. If the profit at the end of the year is Rs. 1,440, then what is the share of Arpit in the profit?

(a) Rs. 630
(b) Rs. 627
(c) Rs. 632
(d) Rs. 629

Q46. What is the difference between the simple interest on a principal of Rs. 5,000 being calculated at 5% per annum for 3 years and 4% per annum for 4 years?

(a) Rs. 45
(b) Rs. 55
(c) Rs. 40
(d) Rs. 50

Q47. The sides of a triangle are 120 cm, 174 cm, and 126 cm. What is its area (in cm^2)?

(a) 7561
(b) 7552
(c) 7560
(d) 7570

Q48. By selling an article for Rs. 528, a trader incurs a loss of 12%. At what price should he sell the article to gain 12%?

(a) Rs. 678
(b) Rs. 672
(c) Rs. 628
(d) Rs. 666

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Q49. The sum of the first 10 prime numbers is:

(a) 131
(b) 129
(c) 133
(d) 130

Q50. 1/20 is what percentage of 10/20 ?

(a) 10%
(b) 30%
(c) 25%
(d) 20%

GENERAL INTELLIGENCE & REASONING

Q51. A, B, C, D, W, X and Y are sitting in a straight line, facing the north.

No one sits to the left of D. Only four people sit between D and C. Only three people sit to the right of Y. X sits to the immediate left of A. W is not an immediate neighbour of Y.

Who sits third to the left of W?

(a) Y
(b) X
(c) C
(d) A

Q52. If 'A' stands for '÷', 'B' stands for '×', 'C' stands for '+' and 'D' stands for '−', what will come in place of the question mark (?) in the following equation?

44 B 30 A 10 D 46 C 3 = ? 3841

(a) 85
(b) 97
(c) 90
(d) 89

Q53. DFRU is related to JLUX in a certain way based on the English alphabetical order. In the same way, BDDG is related to HJGJ. To which of the given options is TVMP related, following the same logic?9948

(a) ZXSW
(b) ZAWE
(c) ZBLO
(d) ZBPS

Q54. Which number should come in place of the question mark (?) in the same sequence to make the series logically complete?

2, 8, 3, 27, 4, 64, 5, 125, 6, 216, 7, ?

(a) 343
(b) 243
(c) 349
(d) 441

Q55. Refer to the following number series and answer the question that follows. Counting to be done from left to right only. (All numbers are single-digit numbers only.)

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

How many such digits are there each of which is immediately preceded by a perfect square and also immediately followed by an odd number?

(NOTE: 1 is also a perfect square)

(a) Four
(b) One

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(c) Two
(d) Three

Q56. In a certain code language,

A + B means ‘A is the son of B’,

A – B means ‘A is the brother of B’,

A x B means ‘A is the wife of B’,

A ÷ B means ‘A is the father of B’.

Based on the above, how is D related to J if ‘D ÷ F x G – H + J’?

(a) Son's wife's brother
(b) Wife's father
(c) Son's wife's father
(d) Wife's mother

Q57. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

GEL OMT WUB ECJ ?

(a) MIK
(b) MKR
(c) MRK
(d) MKI

Q58. In a certain code language, ‘kit son pit’ is coded as ' ai lm go' and ‘boss pit poem’ is coded as ‘lm jn yt’. How is ‘pit’ coded in the given language?

(a) jn
(b) lm
(c) ai
(d) go

Q59. PL 13 is related to SQ 16 in a certain way. In the same way, IE 18 is related to LJ 21. To which of the following is OK 26 related, following the same logic?

(a) RM 28
(b) RP 29
(c) TM 28
(d) TP 29

Q60. Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order.

Only three boxes are kept above G. Only one box is kept between B and G. Only three boxes are kept between B and C. C is kept at some place above G. F is kept immediately below C. E is kept at one of the places above D. A is not kept immediately above or below B.

How many boxes are kept below E?

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

Q61. Seven people, B, C, D, I, J, K and L, are sitting around a circular table facing the centre of the table. Only three people sit between D and L when counted from the right of L. Only three people sit between K and I when counted from the left of K. B sits to the immediate right of D. J is an immediate neighbour of L as well as I. Who sits second to the left of C?

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

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Q62. Select the triad that follows the same pattern as the one followed by the two triads given below. Both triads follow the same pattern.

OH-QK-TV

LE-NH-QS

(a) RK-TN-WZ
(b) SK-TN-WZ
(c) RK-TN-WY
(d) SK-TM-WZ

Q63. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north. Only A sits to the left of D. Only four people sit between A and C. Only B sits between G and F and G is not an immediate neighbour of C. How many people sit to the right of G?

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

Directions

Q64. Seven boxes, M, N,O, P, Q, R and S, are kept one over the other but not necessarily in the same order. Only three boxes are kept above S. Only one box is kept between R and S. Only three boxes are kept between R and Q. Q is kept at some place above S. N is kept immediately below Q. M is kept at one of the places above O. P is not kept immediately above or below R. Which box is kept at the lowermost position?

(a) O
(b) S
(c) N
(d) M

Q65. 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) ORN
(b) VYU
(c) MQL
(d) DGC

Q66. What should come in place of the question mark (?) in the given series?

501 500 497 492 485 ?

(a) 476
(b) 475
(c) 477
(d) 474

Q67. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘x’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘-‘, what will come in place of the question mark ‘?’ in the following equation?

24 A 4 B 6 C 2 D 10 = ?

(a) 28
(b) 27
(c) 26
(d) 29

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

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

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

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immediately followed by an odd number?

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

Q69. In a certain code language, 'TOUR' is coded as '8571' and 'DOUT' is coded as '5478'. What is the code for 'D' in the given code language?

(a) 8
(b) 7
(c) 5
(d) 4

Q70. What will come in the place of '?' in the following equation, if '+' and ' ÷ ' are interchanged and ' - ' and ' x ' are interchanged?

423 + 9 × 19 - 6 ÷ 775 = ?

(a) 236
(b) 708
(c) 214
(d) 220

Q71. Mr. Akai starts from Point A and drives 11 km towards east. He then takes a right turn, drives 5 km, turns right and drives 14 km. He then takes a right turn and drives 16 km. He takes a final right turn, drives 3 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90 degrees turns only unless specified)

(a) 7 km to the north
(b) 7 km to the east
(c) 11 km to the north
(d) 11 km to the south

Q72. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

PDG 12, RFI 16, THK 20, VJM 24, ?

(a) XLP 26
(b) YLO 26
(c) YKP 28
(d) XLO 28

Q73. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some keyboards are mouses.

All inverters are mouses.

Conclusions:

(I) Some keyboards are inverters.

(II) All mouses are inverters.

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

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Q74. 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) QPL
(b) AYV
(c) BZW
(d) DBY

Q75. What should come in place of the question mark (?) in the given series?

33 49 65 81 97 ?

(a) 112
(b) 113
(c) 110
(d) 111

Q76. This question is based on the five, three-digit numbers given below.

(Left) 826, 117, 681, 964, 529 (Right)

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

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

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

(a) 7
(b) 5
(c) 13
(d) 11

Q77. Harshit starts from Point A and drives 6 km towards the east. He then takes a right turn, drives 6 km, turns right and drives 12 km. He then takes a right turn and drives 11 km. He takes a final right turn, drives 6 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only unless specified.)

(a) 5 km to the South
(b) 6 km to the South
(c) 5 km to the North
(d) 6 km to the North

Q78. Refer to the following number series and answer the question that follows. Counting to be done from left to right only. (All numbers are single-digit numbers only.)

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

How many such digits are there each of which is immediately preceded by a perfect square and also immediately followed by a perfect square?

(NOTE: 1 is also a perfect square)

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

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

Statements:

All schools are colleges.

No college is a radio.

Conclusions:

(I) Some colleges are schools.

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(II) No school is a radio.

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

Q80. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(26, 46, 20)

(12, 16, 4)

(a) (7, 23, 13)
(b) (9, 32, 23)
(c) (17, 43, 23)
(d) (20, 31, 8)

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Operation Brahma was launched by India in March 2025 to provide relief to which country?

(a) Sri Lanka
(b) Nepal
(c) Myanmar
(d) Bangladesh

Q82. What was the new motto of Lokpal of India adopted by the full bench of Lokpal in June 2025?

(a) Empower Citizens, Expose Corruption
(b) Prevent Corruption, Promote Growth
(c) Empowering Youth against Corruption
(d) Ma Gridhah Kasyasvidhanam

Q83. Which of the following countries was hosted the 2025 NATO Summit held in June 2025?

(a) Brazil
(b) Turkey
(c) Germany
(d) Netherlands

Q84. What is the purpose of the Bharat Forecasting System launched in May 2025?

(a) Enhancing railway timetables
(b) Providing detailed weather forecasts
(c) Monitoring wildlife habitats
(d) Improving school attendance

Q85. In 2025, how much monthly out-of-pocket allowance was approved for hockey players in the national camp by the Sports Ministry?

(a) Rs. 50,000
(b) Rs. 25,000
(c) Rs. 15,000
(d) Rs. 20,000

Q86. Which of the following departments released the 2025 Economic Survey of India?

(a) Central Statistical Organisation
(b) Ministry of Labour
(c) Department of Commerce

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(d) Department of Economic Affairs

Q87. On 29 April 2025, the Union Minister of New and Renewable Energy (MNRE) Pralhad Joshi launched the GHCI scheme to empower MSMEs and promote green hydrogen economy. What is the full form of GHCI?

(a) Green Hydrogen Certification Scheme of India
(b) Green Hydrogen Cultivation Scheme of India
(c) Green Hydrogen Channel Scheme of India
(d) Green Hydrogen Conservation Scheme of India

Q88. In May 2025, which Indian minister announced the Advanced Medium Combat Aircraft (AMCA) development plans at the CII Business Summit?

(a) Amit Shah
(b) Rajnath Singh
(c) Nirmala Sitharaman
(d) S Jaishankar

Q89. In June 2025, which of the following announced to introduce 'Validated UPI Handles' effective from 1 October 2025 for secured payments by investors to enhance investor protection and combat fraud?

(a) Life Insurance Corporation (LIC)
(b) Securities and Exchange Board of India (SEBI)
(c) Reserve Bank of India (RBI)
(d) State Bank of India (SBI)

Q90. What is the name of the first private-sector reinsurer to be licensed under the new framework of the Insurance Regulatory and Development Authority of India in March 2025?

(a) Arko Pay Reinsurance
(b) Phone Pe Reinsurance
(c) Paytm Reinsurance
(d) Valueattics Reinsurance

Q91. Which prominent world leader joined Truth Social (a social media platform owned by US President Donald Trump) in March 2025?

(a) Narendra Modi
(b) Emmanuel Macron
(c) Rishi Sunak
(d) Olaf Scholz

Q92. Who did Jannik Sinner defeat in the final of the Australian Open 2025?

(a) Alexander Zverev
(b) Daniil Medvedev
(c) Rafael Nadal
(d) Stefanos Tsitsipas

Q93. What was Neeraj Chopra’s final position at the 2025 Doha Diamond League javelin event?

(a) Third
(b) First
(c) Fourth
(d) Second

Q94. In 2025, in which country was the Yala Glacier declared 'dead' due to the effects of climate change?

(a) India
(b) China
(c) Bhutan
(d) Nepal

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Q95. Prime Minister Narendra Modi virtually launched a cooperative society in Bihar to provide easy access to funds at affordable interest rates to community members in September 2025, named _____.

(a) Bihar Rajya Krishi Nidhi Saakh Sahkari Sangh Limited
(b) Bihar Rajya Mahila Nidhi Saakh Sahkari Sangh Limited
(c) Bihar Rajya Jeevika Nidhi Saakh Sahkari Sangh Limited
(d) Bihar Rajya Gramin Nidhi Saakh Sahkari Sangh Limited

Q96. Which athlete received the Laureus World Sportswoman of the Year award in 2025?

(a) Iga Świątek
(b) Naomi Osaka
(c) Simone Biles
(d) A'ja Wilson

Q97. In April 2025, Rapido signed a Memorandum of Understanding with the Ministry of Labour and Employment to provide jobs through which of the following government portals?

(a) National Career Service Portal
(b) Startup India Portal
(c) Digital India Portal
(d) Skill India Portal

Q98. The Indus Water Treaty, which was suspended by India following the Pahalgam terror attack in April 2025, was signed between India and Pakistan in _____.

(a) 1950
(b) 1965
(c) 1955
(d) 1960

Q99. Which summit in 2025 focused on 'securing our future' for Ukraine?

(a) Kiev Peace Conference
(b) London Summit on Ukraine
(c) Paris Peace Forum
(d) Warsaw NATO Ministers' Summit

Q100. How many positions did India drop in the 2025 Energy Transition Index compared to the previous year?

(a) 8
(b) 6
(c) 5
(d) 10

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (c) Copper sulphate solution

The correct answer is Copper sulphate solution.

Key Points

• Tyndall effect refers to the scattering of light by particles in a colloid or a very fine suspension. It is visible when the particles are large enough to scatter light but small enough to remain suspended.

• Copper sulphate solution is a true solution where the solute particles are completely dissolved in the solvent. The particle size is extremely small (less than 1 nm), and hence, it does not scatter light. Therefore, it does not show Tyndall effect.

• Emulsions, such as oil in water, are colloidal systems where the dispersed phase scatters light due to larger particle sizes (1-1000 nm). Hence, they exhibit Tyndall effect.

• Milk is a colloidal suspension of fat globules in water, making it capable of scattering light. Thus, milk shows Tyndall effect.

• Starch solution is a colloidal suspension, and its particles scatter light, demonstrating the Tyndall effect. Hence, it shows Tyndall effect.

• Thus, the correct answer is Copper sulphate solution.

Additional Information

• Tyndall Effect:

• The phenomenon is named after John Tyndall, who studied the scattering of light by particles in 1869.

• It occurs when light passes through a colloidal system or a suspension, and the scattered light makes the path of the beam visible.

• It is commonly observed in phenomena like sunlight passing through mist or a dusty room.

• True solutions, like salt or sugar dissolved in water, do not exhibit Tyndall effect because their particles are too small to scatter light.

• Colloids:

• A colloid is a mixture in which one substance is dispersed evenly throughout another substance.

• Particle size in colloids ranges from 1 nm to 1000 nm, which is large enough to scatter light but small enough to remain suspended.

• Examples include milk, fog, and gelatin.

• True Solutions:

• True solutions are homogeneous mixtures where the solute is completely dissolved in the solvent.

• Particle size in true solutions is less than 1 nm, making it impossible for them to scatter light.

• Examples include salt dissolved in water and sugar solution.

• Applications of Tyndall Effect:

• Used in distinguishing colloidal solutions from true solutions.

• Helpful in determining the size and nature of particles in solutions.

• Applied in nephelometry and turbidimetry for measuring the concentration of suspended particles.

Important Points

• Key Characteristics of Colloids:

• Colloids exhibit properties such as Brownian movement, charge stability, and Tyndall effect.

• They are widely used in industries like pharmaceuticals, food processing, and cosmetics for creating stable mixtures.

• Colloids are classified as sols, gels, emulsions, foams, etc., based on the state of the dispersed phase and the dispersion medium.

• Importance of Particle Size:

• Particle size determines the ability of a system to exhibit the Tyndall effect.

• Larger particles (>1000 nm) settle due to gravity (as in suspensions), while smaller particles (<1 nm) do not scatter light (as in true solutions).

• Scientific Applications:

• Tyndall effect is used in optical instruments to study particle properties.

• It is applied in environmental sciences to monitor airborne pollutants and water quality.

Q2. Answer: (d) In stethoscopes, the sound of the patient's heartbeat reaches the doctor's ears by multiple reflection of s...

The correct answer is In stethoscopes, the sound of the patient's heartbeat reaches the doctor's ears by multiple reflection of

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sound..

Key Points

• Principle of Multiple Reflection: The stethoscope operates on the principle of multiple reflection of sound waves. The sound of the heartbeat is captured by the diaphragm of the stethoscope and is reflected multiple times inside the hollow tubes, enhancing its clarity and allowing it to reach the doctor's ears effectively.

• Acoustic Tubes: The stethoscope contains acoustic tubes that guide the sound from the chest piece to the doctor's ears. These tubes are designed to minimize sound loss and ensure that the sound waves travel efficiently through the device.

• Diaphragm and Bell Mechanism: The chest piece of the stethoscope consists of a diaphragm (for high-pitched sounds) and a bell (for low-pitched sounds). The diaphragm detects vibrations caused by the heartbeat, and these vibrations are converted into sound waves.

• Amplification without Electricity: Unlike some modern electronic stethoscopes, the traditional stethoscope does not use electricity to amplify sound. Instead, it relies on the natural amplification provided by the design of the acoustic chambers and the process of multiple reflections.

• Sound Clarity: The multiple reflections help in amplifying and clarifying the sound, making it easier for doctors to detect abnormalities in the heartbeat, such as murmurs or irregular rhythms.

Additional Information

• Parts of a Stethoscope:

• Chest Piece: Contains the diaphragm and bell, used to capture sound.

• Acoustic Tubes: Hollow tubes that transmit sound to the doctor's ears through multiple reflections.

• Ear Tubes: Metal tubes that connect to the ear tips and deliver sound to the doctor's ears.

• Ear Tips: Soft tips that fit into the doctor's ears for comfort and to block external noise.

• Modern Enhancements: Some modern stethoscopes include electronic amplification and noise cancellation features, but traditional acoustic stethoscopes remain widely used due to their simplicity and reliability.

• Importance in Medicine: Stethoscopes are essential for diagnosing conditions such as heart murmurs, arrhythmias, and respiratory issues. They allow doctors to listen to internal sounds without invasive procedures.

• History: The stethoscope was invented by René Laennec in 1816. Initially, it was a simple wooden tube, but it has since evolved into the modern design we see today.

• Applications: Apart from detecting heart and lung sounds, stethoscopes are also used in blood pressure measurement (in conjunction with a sphygmomanometer).

Important Points

• Option Analysis:

• Option 1: The statement that sound travels directly without reflection is incorrect because sound undergoes multiple reflections within the stethoscope.

• Option 2: The stethoscope does not use electricity to amplify sound in its traditional form. This is incorrect for non-electronic stethoscopes.

• Option 3: Sound is not carried by moving air but by vibrations transmitted through the stethoscope's tubes. Hence, this is incorrect.

• Option 4: This is correct because the sound of the heartbeat reaches the doctor's ears through multiple reflections inside the stethoscope.

• Stethoscope Care: Proper maintenance, such as cleaning the diaphragm and ear tips, ensures accurate performance and hygiene.

• Advanced Applications: In modern medical practices, stethoscopes are sometimes integrated with digital recording and analysis tools for detailed diagnosis.

Q3. Answer: (a) Bus

The correct answer is Bus.

Key Points

• Force required to stop a moving vehicle is directly proportional to the vehicle's mass and its velocity. Since all vehicles are moving at the same velocity (50 km/hr), the determining factor here is the mass of the vehicle.

• A bus has significantly more mass compared to a bicycle, car, or scooter. Hence, it will require more force to bring it to a stop.

• The equation for force is derived from Newton's second law of motion:

• F = ma, where F is force, m is mass, and a is acceleration (or deceleration in this case).

• A larger mass (bus) will result in a greater force being required to achieve the same deceleration.

• The stopping distance and braking force also depend on the kinetic energy of the vehicle, which is given by the formula: K.E. = 1/2 mv^2. Since the velocity (v) is constant for all vehicles, the kinetic energy is directly proportional to the mass. The bus, having the highest mass, possesses the highest kinetic energy and hence requires the most force to stop.

• Frictional forces between the tires and the road surface, as well as the efficiency of the braking system, also play a role. However, the primary determinant in this scenario remains the mass of the vehicle.

Additional Information

• Newton's Second Law of Motion:

• This law states that the force acting on an object is equal to the mass of the object multiplied by its acceleration (F = ma).

• In the context of braking, negative acceleration (deceleration) is applied to bring the vehicle to a stop. A heavier vehicle like a bus requires more force to achieve the same deceleration as a lighter vehicle.

• Kinetic Energy:

• Kinetic energy is the energy possessed by a body due to its motion and is given by the formula K.E. = 1/2 mv^2.

• As the mass of the vehicle increases, its kinetic energy increases proportionally, making it harder to stop the vehicle. This is why a bus, being the heaviest among the given options, requires the most force to stop.

• Factors Affecting Braking Force:

• The mass of the vehicle: Heavier vehicles require more force to stop.

• The velocity of the vehicle: Higher speeds result in greater kinetic energy, requiring more force for deceleration.

• The condition of the brakes: Well-maintained brakes can generate higher frictional force, aiding in quicker stopping.

• Road conditions: Slippery or uneven surfaces can reduce the effectiveness of braking.

• Examples:

• In real-world scenarios, heavy vehicles like buses and trucks require longer stopping distances and more robust braking systems compared to lighter vehicles such as bicycles or scooters.

• Highway safety measures often account for the increased stopping distance of heavy vehicles by providing longer braking zones.

Important Points

• Role of Braking Systems: Advanced braking systems like Anti-lock Braking System (ABS) are used in modern vehicles to prevent skidding and reduce stopping distance, especially in heavy vehicles like buses.

• Momentum: The momentum of a vehicle is the product of its mass and velocity (p = mv). A bus has a greater momentum than a bicycle, car, or scooter at the same velocity, requiring more force to stop.

• Energy Dissipation: Brakes convert the kinetic energy of a moving vehicle into heat energy. A bus, with higher kinetic energy, generates more heat during braking, requiring a more efficient braking system.

• Real-life Application: The design of braking systems for heavy vehicles takes into account their higher mass and momentum. This is why buses and trucks are equipped with air brakes or hydraulic brakes, which provide greater stopping power.

Q4. Answer: (b) Individuals who have multiple unprotected sexual partners

The correct answer is Individuals who have multiple unprotected sexual partners.

Key Points

• HIV (Human Immunodeficiency Virus) is primarily transmitted through unprotected sexual intercourse, sharing of needles, and from mother to child during pregnancy, childbirth, or breastfeeding.

• Individuals who have multiple unprotected sexual partners are at significantly higher risk of contracting HIV due to increased exposure to potential carriers of the virus. This applies to heterosexual, homosexual, or bisexual relationships.

• Unprotected sexual activities can result in direct exposure to infected bodily fluids such as semen, vaginal fluids, or blood, which are primary carriers of the HIV virus.

• While maintaining personal hygiene and regular exercise are beneficial for overall health, they do not influence the risk of HIV infection. Hence, these factors are not directly related to HIV risk.

• Using protective measures like condoms during intercourse and undergoing regular health check-ups can significantly reduce the risk of HIV infection for individuals with multiple sexual partners.

Additional Information

• HIV Transmission Modes:

• Sexual Contact: The most common route of HIV transmission globally is through unprotected vaginal or anal intercourse.

• Blood Transmission: Sharing needles or syringes contaminated with infected blood can lead to HIV transmission, especially among intravenous drug users.

• Mother-to-Child: HIV can be transmitted from an infected mother to her child during pregnancy, childbirth, or breastfeeding.

• Infected Blood Products: Receiving contaminated blood or blood products during transfusions is another potential source of HIV infection, though this has decreased significantly with modern blood screening techniques.

• Prevention Strategies:

• Practice safe sex by using condoms consistently and correctly.

• Regular HIV testing, especially for individuals with multiple sexual partners or those engaging in high-risk behaviors, helps in early detection and treatment.

• Utilize Pre-Exposure Prophylaxis (PrEP), a medication for individuals at high risk of HIV infection, to prevent transmission.
• Avoid sharing needles and syringes, and ensure that tattoo or piercing equipment is sterilized properly.
• Global Statistics:
• According to the World Health Organization (WHO), approximately 38.4 million people were living with HIV globally as of 2021.
• Sub-Saharan Africa remains the most heavily affected region, accounting for nearly two-thirds of the global HIV cases.
• Early diagnosis and access to antiretroviral therapy (ART) have significantly reduced the mortality rate associated with HIV/AIDS.
• Important Points:
• HIV cannot be transmitted through casual contact such as hugging, shaking hands, or sharing food and water.
• Maintaining a healthy immune system through proper nutrition and lifestyle choices can support overall health but does not prevent HIV infection.
• Individuals in high-risk categories, such as sex workers, intravenous drug users, and men who have sex with men, should receive targeted education and prevention resources.

Q5. Answer: (d) Parenchyma

The correct answer is Parenchyma.

Key Points

• Parenchyma is the most common and widely distributed simple permanent tissue in plants.
• It consists of thin-walled, living cells that are loosely arranged, leaving large intercellular spaces.
• This tissue performs various functions such as photosynthesis, storage of food, and secretion.
• Parenchyma cells are found in almost all parts of the plant, including the cortex, pith, mesophyll of leaves, and vascular tissues.
• They can be specialized into forms like chlorenchyma (for photosynthesis) and aerenchyma (for buoyancy in aquatic plants).
• Their ability to divide and differentiate also makes them crucial for wound healing and regeneration in plants.

Additional Information

• Sclerenchyma:
• This tissue consists of dead cells with very thick walls, hardened due to lignin.
• Sclerenchyma provides mechanical support and rigidity to plants.
• It is commonly found in regions like the seed coat, nut shells, and around vascular bundles.
• Types of sclerenchyma include fibers and sclereids, which vary in shape and function.
• Aerenchyma:
• A specialized form of parenchyma tissue found in aquatic plants.
• It contains large air spaces between cells, aiding in buoyancy and facilitating gas exchange.
• This tissue is crucial for plants growing in waterlogged conditions.
• Examples include hydrophytes like water hyacinth and lotus.
• Chlorenchyma:
• A type of parenchyma tissue rich in chloroplasts, enabling it to perform photosynthesis.
• It is present in the green parts of plants, such as leaves and stems.
• Chlorenchyma plays a vital role in the production of food and energy for plants.
• Parenchyma:
• Parenchyma cells are living and have the ability to divide, which helps in plant growth and repair.
• This tissue is versatile and adapts to various functions such as storage, photosynthesis, secretion, and transport.
• Parenchyma can transform into other cell types during secondary growth, showcasing its plasticity.
• Examples include the storage parenchyma in potato tubers and photosynthetic parenchyma in leaf mesophyll.
• Important Points:
• Permanent tissues are classified into simple and complex types based on their structure and function.
• Simple permanent tissues consist of similar types of cells, while complex tissues like xylem and phloem consist of different cell types.
• Simple tissues include parenchyma, collenchyma, and sclerenchyma, with parenchyma being the most abundant.
• The intercellular spaces in parenchyma aid in gaseous exchange and nutrient storage.

Q6. Answer: (c) Honey

The correct answer is Honey.

Key Points

• Apiaries, also known as bee farms, are places where beekeeping is conducted to maintain colonies of honeybees for the production of honey and other bee-related products like beeswax.

• Honey production involves honeybees collecting nectar from flowers, which is then enzymatically transformed into honey and stored in honeycombs.

• Apiaries are critical for maintaining healthy bee populations, which are essential for pollination. Pollination directly affects the growth of various crops and ecosystems.

• Honey is a natural sweetener, rich in antioxidants, and has been used for centuries for its nutritional and medicinal properties.

• Apiaries are also an environmentally friendly and sustainable way to produce honey, contributing to biodiversity and the health of plant ecosystems.

Additional Information

• Characteristics of Honey:

• Honey is composed of natural sugars like fructose and glucose, along with vitamins, minerals, and antioxidants.

• It exhibits antibacterial and antifungal properties, making it a popular choice for traditional medicine.

• Honey is used as an energy booster, digestive aid, and natural remedy for wounds and sore throats.

• Importance of Beekeeping:

• Beekeeping contributes to pollination, which is vital for the reproduction of many flowering plants and crops.

• It supports the production of other agricultural products by increasing crop yields and improving quality.

• Beekeeping generates employment opportunities and provides an additional source of income to rural communities.

• Other Products from Apiaries:

• Beeswax: Used in the production of candles, cosmetics, and polishes.

• Royal Jelly: A nutrient-rich substance produced by worker bees, known for its health benefits.

• Propolis: A resin-like material used for its medicinal properties and in health supplements.

• Comparison with Other Options:

• Poultry Egg: Obtained from poultry farming, not related to apiaries.

• Fish: Produced through aquaculture or fishing, unrelated to beekeeping.

• Milk: Derived from dairy farming, involving animals like cows, buffaloes, and goats, and not associated with apiaries.

Important Points

• Global Honey Production:

• China is the largest producer of honey globally, followed by countries like Turkey and India.

• India is one of the major exporters of honey, particularly to countries like the USA, Saudi Arabia, and the UAE.

• Role of Honeybees in Agriculture:

• Honeybees are responsible for the pollination of approximately 70% of the world’s crops.

• Key crops like apples, almonds, and blueberries rely heavily on bee pollination.

• Threats to Honeybee Populations:

• Factors like pesticide usage, habitat loss, and climate change pose significant threats to honeybee populations.

• Efforts like organic farming and establishing more apiaries can help mitigate these threats.

Q7. Answer: (b) Uniform circular motion

The correct answer is Uniform circular motion.

Key Points

• Uniform circular motion refers to the motion of an object traveling along a circular path with a constant speed.

• Even though the speed remains constant, the direction of motion continuously changes, resulting in a change in velocity. This change in velocity means that the object is accelerating, as acceleration is defined as the rate of change of velocity.

• The acceleration in uniform circular motion is directed towards the center of the circular path, and this is called centripetal acceleration.

• The force responsible for maintaining the circular motion is called the centripetal force, which acts perpendicular to the velocity of the object and towards the center of the circle.

• Examples of uniform circular motion include the motion of a satellite in orbit, the movement of a car around a circular track at constant speed, and the rotation of a fan blade.

Additional Information

• Non-linear motion:

• This refers to motion that does not follow a straight line. It can involve changes in direction or curved paths. Examples include projectile motion and motion along parabolic or elliptical paths.

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• It is not specific to circular motion and does not necessarily involve constant speed. Hence, this option is incorrect in the context of the question.

• Linear motion:

• Linear motion refers to motion in a straight line, such as a car moving on a straight road or a free-falling object under gravity.

• Since the question specifies motion along a circular path, this option is incorrect as circular motion is not linear.

• Non-uniform circular motion:

• Non-uniform circular motion occurs when an object moves along a circular path but with a varying speed.

• This is different from uniform circular motion, where the speed remains constant. Hence, this option is also incorrect in the context of the question.

• Characteristics of Uniform Circular Motion:

• The magnitude of velocity (speed) is constant.

• The direction of velocity changes continuously as the object moves along the circular path.

• The force responsible for maintaining the circular motion (centripetal force) is always directed towards the center of the circle.

• The acceleration acting on the object (centripetal acceleration) is also directed towards the center of the circle and is perpendicular to the velocity.

Important Points

• Examples of Uniform Circular Motion:

• The motion of planets around the sun in circular orbits.

• The movement of electrons around the nucleus in an atom (in simplified models).

• A vehicle moving at constant speed around a circular track.

• The rotation of a ceiling fan or a merry-go-round at a constant speed.

• Equations for Uniform Circular Motion:

• The centripetal force is given by: $F = (mv^2)/r$, where m is the mass of the object, v is its speed, and r is the radius of the circular path.

• The centripetal acceleration is given by: $a = v^2/r$.

• The time period of revolution (T) is the time taken to complete one full circle and is related to the speed and radius by $T = 2\pi r/v$.

Q8. Answer: (c) Ethanol burns with a clean, smokeless flame

The correct answer is Ethanol burns with a clean, smokeless flame.

Key Points

• Ethanol burns with a clean, smokeless flame: This is the most significant property that makes ethanol a better alternative fuel compared to petrol. When ethanol combusts, it produces fewer harmful emissions such as carbon monoxide and particulates. This ensures cleaner air and reduces environmental pollution.

• Renewable Source: Ethanol is produced from biomass such as corn, sugarcane, and other plant materials, making it a renewable source of energy. In contrast, petrol is derived from fossil fuels, which are non-renewable and depleting resources.

• Lower Greenhouse Gas Emissions: The combustion of ethanol results in lower greenhouse gas emissions compared to petrol. This contributes to mitigating climate change and achieving sustainability goals.

• High Octane Number: Ethanol has a higher octane number than petrol, which helps improve engine performance and efficiency while reducing the likelihood of engine knocking.

• Biodegradability: Ethanol is biodegradable, meaning that any accidental spills or leaks cause minimal environmental damage compared to the harmful effects of petrol spills.

Additional Information

• Properties of Ethanol:

• Ethanol is a colorless, volatile, and flammable liquid. It is commonly used as a biofuel and blending agent with petrol.

• It has a lower energy content per liter compared to petrol, meaning vehicles running on ethanol may need more fuel to cover the same distance.

• Comparison of Ethanol and Petrol:

• Environmental Impact: Ethanol produces fewer toxic emissions, including carbon monoxide and unburned hydrocarbons, whereas petrol combustion releases more pollutants.

• Sustainability: Ethanol is derived from renewable sources like plants, whereas petrol is a fossil fuel derived from crude oil, a finite resource.

• Economic Benefits: The production of ethanol can boost the agricultural sector, providing farmers with additional income through the cultivation of ethanol-producing crops like sugarcane and corn.

• Applications of Ethanol as a Fuel:

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• Ethanol is widely used as a fuel additive to petrol (e.g., E10, E85 blends) to reduce harmful emissions and improve engine efficiency.

• It is also used in flexible-fuel vehicles (FFVs) that can run on high ethanol blends or even pure ethanol.

• Challenges in Ethanol Usage:

• The energy density of ethanol is lower than that of petrol, which can lead to reduced mileage.

• Large-scale ethanol production may lead to food vs. fuel conflicts, as crops like corn and sugarcane are used for both food and ethanol production.

• Storage and transportation of ethanol require special handling due to its hygroscopic nature (it absorbs water from the environment).

Important Points

• Statement 1: Ethanol is a solid fuel – This is incorrect. Ethanol is a liquid fuel, not a solid one.

• Statement 2: Ethanol has a higher boiling point than petrol – This is incorrect. Ethanol's boiling point (78.5°C) is lower than petrol's boiling range (typically 95–200°C).

• Statement 3: Ethanol burns with a clean, smokeless flame – This is correct. Ethanol combustion produces fewer particulates, making it a cleaner alternative.

• Statement 4: Ethanol produces harmful smoke when burned – This is incorrect. Ethanol produces significantly less harmful smoke compared to petrol.

Q9. Answer: (b) 180 u

The correct answer is 180 u.

Key Points

• The molecular formula of glucose is C6H12O6, which represents six carbon atoms, twelve hydrogen atoms, and six oxygen atoms.

• The atomic masses of the elements involved are as follows: Carbon (C) = 12 u, Hydrogen (H) = 1 u, and Oxygen (O) = 16 u.

• To calculate the molecular mass of glucose, multiply the atomic mass of each element by the number of atoms of that element in the molecule:

• Carbon: 12 u × 6 = 72 u

• Hydrogen: 1 u × 12 = 12 u

• Oxygen: 16 u × 6 = 96 u

• Add these values to find the molecular mass of glucose:

• Molecular mass = 72 u + 12 u + 96 u = 180 u

• Hence, the molecular mass of glucose is 180 u.

Additional Information

• Glucose:

• Glucose is a simple sugar and a type of carbohydrate with the molecular formula C6H12O6.

• It is an important source of energy for living organisms and is commonly found in fruits and honey.

• In plants, glucose is produced during photosynthesis, using sunlight, carbon dioxide, and water.

• Molecular Mass:

• The molecular mass of a compound is the sum of the atomic masses of all the atoms in its molecular formula.

• It is expressed in atomic mass units (u).

• Molecular mass is a key property used to understand the behavior and reactions of molecules.

• Atomic Mass:

• The atomic mass of an element is the weighted average mass of its isotopes, measured in atomic mass units (u).

• For example, the atomic masses of Carbon, Hydrogen, and Oxygen are approximately 12 u, 1 u, and 16 u, respectively.

• Applications of Glucose:

• Glucose is widely used in the food and beverage industry as a sweetener.

• It is also used in the pharmaceutical industry as an energy supplement and in intravenous solutions.

• In biological processes, glucose is a primary substrate for cellular respiration, providing energy (ATP).

• Importance of Molecular Mass in Chemistry:

• Molecular mass is essential for calculating chemical quantities, such as moles and molarity.

• It helps in determining the stoichiometry of chemical reactions.

• Understanding molecular mass is crucial for fields like biochemistry, medicine, and materials science.

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Q10. Answer: (a) Acromegaly

The correct answer is Acromegaly.

Key Points

• Acromegaly is a hormonal disorder that develops when the pituitary gland produces excess growth hormone (GH) in adulthood.

• Unlike in children, where excess GH causes gigantism, in adults, it leads to abnormal growth of bones and tissues, especially in the hands, feet, and face.

• The primary cause of acromegaly is a benign tumor (adenoma) in the pituitary gland, which secretes excessive growth hormone.

• Symptoms include enlarged hands and feet, changes in facial features (e.g., protruding jaw and brow), joint pain, thickened skin, and sometimes complications like diabetes and hypertension.

• Diagnosis is made through blood tests for elevated levels of insulin-like growth factor-1 (IGF-1) and imaging studies like an MRI to locate the tumor.

• Treatment options include surgery to remove the tumor, medications to block GH production, and radiation therapy.

Additional Information

• Graves' Disease:

• It is an autoimmune disorder that causes hyperthyroidism, where the thyroid gland produces excessive thyroid hormones.

• Symptoms include bulging eyes (exophthalmos), weight loss, rapid heartbeat, and irritability.

• It primarily affects women and is often treated with antithyroid medications, radioactive iodine therapy, or surgery.

• Addison's Disease:

• This is a rare disorder where the adrenal glands do not produce enough cortisol and aldosterone.

• Symptoms include fatigue, weight loss, low blood pressure, and hyperpigmentation of the skin.

• Treatment involves hormone replacement therapy to correct the levels of deficient hormones.

• Dwarfism:

• Dwarfism is a condition characterized by short stature, typically resulting from a genetic mutation or hormonal deficiencies such as growth hormone deficiency in childhood.

• It contrasts with acromegaly, as it occurs when growth hormone levels are insufficient during growth years.

• Management depends on the type of dwarfism and may include growth hormone therapy in certain cases.

• Growth Hormone (GH):

• Produced by the anterior pituitary gland, GH plays a crucial role in regulating growth, metabolism, and cell regeneration.

• GH levels are highest during childhood and adolescence, promoting the growth of bones and tissues.

• Both over-secretion (acromegaly/gigantism) and under-secretion (dwarfism) of GH can lead to significant health issues.

Important Points

• Gigantism vs. Acromegaly:

• Gigantism occurs in children when excess GH secretion happens before the fusion of growth plates, leading to abnormal height and proportional growth.

• Acromegaly occurs in adults after the growth plates have fused, leading to thickening of bones and tissues rather than increased height.

• Complications of Acromegaly:

• Untreated acromegaly can lead to severe complications such as cardiovascular diseases, diabetes mellitus, sleep apnea, and arthritis.

• Early diagnosis and treatment are essential to prevent these complications and improve the quality of life.

• Diagnostic Tests for Hormonal Disorders:

• Blood tests to measure levels of hormones like GH, IGF-1, cortisol, and thyroid hormones are critical for diagnosing related disorders.

• Imaging techniques like MRI or CT scans are used to detect pituitary tumors or adrenal gland abnormalities.

Q11. Answer: (b) Virtual and erect image

The correct answer is Virtual and erect image.

Key Points

• A convex mirror always forms a virtual and erect image, irrespective of the position of the object.

• The image formed by a convex mirror is always diminished, meaning it is smaller than the actual object.

• A convex mirror diverges the reflected light rays, making them appear to originate from a single point behind the mirror. This is why the image is virtual and cannot be projected on a screen.

• Unlike concave mirrors, a convex mirror does not produce real images because the reflected rays never actually meet but appear to diverge from a point behind the mirror.

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• Convex mirrors are widely used in vehicles as rearview mirrors due to their ability to provide a wider field of view and erect images.

Additional Information

• Characteristics of Convex Mirror:

• Convex mirrors have a reflecting surface that bulges outward.

• They are also known as diverging mirrors because they cause parallel rays of light to spread apart after reflection.

• The focal length of a convex mirror is positive, and the focus is virtual and located behind the mirror.

• The image formed by a convex mirror is always located behind the mirror and is smaller than the object.

• Applications of Convex Mirrors:

• Used as rearview mirrors in vehicles to provide a wide field of view, helping drivers see traffic behind them.

• Installed in parking areas and driveways for better visibility and to prevent accidents.

• Used in security and surveillance systems for monitoring large areas.

• Other Types of Mirrors:

• Concave Mirror: Forms real or virtual images depending on the object's position. Images can be magnified or inverted.

• Plane Mirror: Always forms virtual and erect images that are the same size as the object.

• Key Equations of Mirrors:

• The mirror formula is given by: $1/f = 1/v + 1/u$, where f is the focal length, v is the image distance, and u is the object distance.

• The magnification (M) is calculated using: $M = h'/h = -v/u$, where h' is the height of the image, and h is the height of the object.

Important Points

• Option 1: Magnified image: A convex mirror never forms a magnified image, as the image is always diminished. This option is incorrect.

• Option 2: Virtual and erect image: This is the only correct statement, as convex mirrors always form virtual, erect, and diminished images.

• Option 3: Real and inverted image: Real images are not formed by convex mirrors because the reflected rays diverge and never actually meet. This option is incorrect.

• Option 4: Real and erect image: Convex mirrors do not produce real images, making this option incorrect.

Q12. Answer: (d) sulphide

The correct answer is sulphide.

Key Points

• Roasting is a metallurgical process in which a sulphide ore is heated in the presence of excess air to convert it into its oxide form. This is a necessary step before the ore can be reduced to the pure metal.

• The primary purpose of roasting is to eliminate sulphur from the ore by converting it into gaseous sulphur dioxide (SO_2). For example, zinc sulphide (ZnS) is roasted to form zinc oxide (ZnO).

• Sulphide ores are particularly suitable for roasting because they release harmful sulphur compounds during heating, which must be oxidized into a less harmful form.

• Roasting is commonly used for sulphide ores like zinc blende (ZnS), cinnabar (HgS), and galena (PbS). For example:

• $ZnS + O_2 \rightarrow ZnO + SO_2$

• $PbS + O_2 \rightarrow PbO + SO_2$

• Unlike sulphide ores, carbonate, chloride, and sulphite ores are not primarily treated using roasting. They require different processes such as calcination or leaching.

Additional Information

• Roasting vs. Calcination:

• Roasting is carried out in the presence of excess air to oxidize sulphide ores into oxides. It also helps remove volatile impurities such as sulphur dioxide.

• Calcination, on the other hand, is done in the absence or limited supply of air and is used for carbonate and hydroxide ores to drive off carbon dioxide or water.

• Processes for Other Ores:

• Carbonate ores: These are typically treated by calcination. For example, calcium carbonate ($CaCO_3$) is heated to produce calcium oxide (CaO) and carbon dioxide (CO_2).

• Chloride ores: These are usually treated by leaching or electrolysis. For instance, sodium chloride ($NaCl$) is used in the electrolysis process to produce sodium and chlorine.

• Sulphite ores: Sulphite ores are rare and are generally processed differently, often involving chemical methods to extract the desired metal.

• Environmental Impact:

• The roasting process releases sulphur dioxide (SO2), which is a major contributor to air pollution and acid rain. Modern roasting facilities employ gas scrubbers to capture and convert SO2 into useful by-products like sulphuric acid.

• Common Metals Extracted via Roasting:

• Zinc: Extracted from zinc blende (ZnS).

• Lead: Extracted from galena (PbS).

• Copper: Extracted from copper pyrites (CuFeS2).

Important Points

• Thermodynamics of Roasting: Roasting is an exothermic process, and the heat generated helps sustain the reaction.

• Reactions in Roasting: In addition to oxide formation, other reactions such as sulphation (formation of sulphates) and chlorination (formation of metal chlorides) can also occur depending on the conditions.

• Industrial Use: The sulphur dioxide generated during roasting is often converted into sulphuric acid, a valuable industrial chemical.

Q13. Answer: (d) Burning in air

The correct answer is Burning in air.

Key Points

• Chemical properties describe the ability of a substance to undergo chemical changes, resulting in the formation of new substances. Burning in air involves a chemical reaction where the substance reacts with oxygen to produce new compounds, such as carbon dioxide and water. Hence, this is a chemical property.

• Boiling point is a physical property as it involves a phase change from liquid to gas without altering the chemical composition of the substance. Hence, this is not a chemical property.

• Melting point, like boiling point, is a physical property that signifies the temperature at which a solid becomes a liquid. It does not involve a chemical change. Hence, this is not a chemical property.

• Fluidity refers to the ability of a substance to flow, which is related to its physical characteristics like viscosity and state of matter. It does not involve a chemical reaction. Hence, this is not a chemical property.

• Burning in air is a chemical property because it involves oxidation, a chemical reaction resulting in the formation of new substances. For example, burning wood produces ash, carbon dioxide, and water vapor, which are chemically different from the original wood.

Additional Information

• Definition of chemical properties: Chemical properties are characteristics of a substance that become evident during a chemical reaction. Examples include flammability, reactivity with acids, and oxidation states.

• Examples of chemical properties:

• Flammability: The ability of a substance to burn in the presence of oxygen, such as wood or gasoline.

• Reactivity with acids: Substances like metals reacting with acids to produce hydrogen gas.

• Oxidation: The ability of a substance to react with oxygen, like rusting of iron.

• Physical properties vs. chemical properties:

• Physical properties can be observed without changing the substance's chemical identity, e.g., color, boiling point, and melting point.

• Chemical properties involve observing how a substance reacts chemically, leading to the formation of new substances.

• Combustion process: Combustion is a chemical reaction where a substance reacts with oxygen to release energy in the form of heat and light. For instance, burning hydrocarbons produces carbon dioxide and water.

• Industrial significance: Understanding chemical properties is crucial in industries like pharmaceuticals, materials science, and environmental studies for developing new compounds and understanding reactions.

Important Points

• Burning in air: This process is an example of oxidation, which is a type of chemical reaction. It is exothermic, releasing energy.

• Boiling and melting points: These are physical properties that are used to identify substances but do not involve chemical changes.

• Fluidity: It is related to the physical state and viscosity of a substance and does not involve chemical reactivity.

• Understanding the distinction between physical and chemical properties is essential for scientific studies and industrial applications, as it helps predict the behavior of substances under different conditions.

Q14. Answer: (c) Sexual reproduction

The correct answer is Sexual reproduction.

Key Points

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• Sexual reproduction is a biological process in which both male and female sexes are involved to produce offspring.

• It involves the fusion of specialized cells known as gametes (male sperm and female egg), leading to the formation of a zygote.

• This process ensures genetic variation, as the offspring inherit characteristics from both parents, promoting adaptability and evolution.

• Sexual reproduction occurs in humans, animals, and many plants. In plants, the male and female gametes are produced in different structures, such as stamens and carpels.

• Unlike asexual reproduction methods (like budding, spore formation, fragmentation), sexual reproduction necessarily requires the involvement of two parents of opposite sexes.

Additional Information

• Budding:

• Budding is an asexual reproduction method where a new organism grows from a bud or an outgrowth on the parent body.

• It is commonly seen in organisms like yeast and hydra. In this process, only one parent is involved, and the offspring is genetically identical to the parent.

• Spore Formation:

• Spore formation is another asexual reproduction method where organisms produce spores that develop into new individuals.

• It is common in fungi, algae, and bacteria. Spores are highly resistant structures designed for survival under unfavorable conditions.

• Fragmentation:

• Fragmentation is an asexual reproduction process where an organism breaks into fragments, and each fragment develops into a new organism.

• This method is prevalent in sponges, algae, and flatworms. It requires only one parent and produces genetically identical offspring.

• Advantages of Sexual Reproduction:

• Sexual reproduction provides genetic diversity, helping species survive and adapt to changing environments.

• It reduces the risk of genetic disorders caused by mutation accumulation, unlike asexual reproduction.

• It facilitates evolution and natural selection, ensuring the survival of the fittest.

Important Points

• Examples of Sexual Reproduction:

• In humans, the male gamete (sperm) and female gamete (egg) fuse during fertilization to form a zygote.

• In flowering plants, the pollen grain (male gamete) fertilizes the ovule (female gamete) to form seeds.

• In animals like frogs, external fertilization occurs in water, where sperm and eggs are released simultaneously.

• Key Components of Sexual Reproduction:

• Meiosis: A special type of cell division that produces haploid gametes.

• Fertilization: The fusion of male and female gametes to form a diploid zygote.

• Genetic Recombination: Exchange of genetic material during meiosis ensures variation.

• Evolutionary Perspective:

• Sexual reproduction plays a crucial role in the adaptive evolution of species.

• It introduces new gene combinations, helping organisms cope with environmental challenges.

Q15. Answer: (c) Molecular movement is only found in animals, not plants.

The correct answer is Molecular movement is only found in animals, not plants.

Key Points

• Statement 1: Growth-related movement in plants, like bending toward light, is a form of movement. Plants exhibit phototropism, which is their ability to grow toward light due to the action of auxin hormones. This is a correct statement.

• Statement 2: Living organisms show internal or molecular movement, even when external movement is not visible. Internal processes such as cellular respiration, cytoplasmic streaming, and molecular transport are universal to living organisms. This statement is correct.

• Statement 3: Molecular movement is only found in animals, not plants. This is incorrect because plants also exhibit molecular movement, including nutrient transport through xylem and phloem, photosynthesis, and cellular processes. Hence, this is the correct option.

• Statement 4: Movement is a characteristic of living organisms. Movement, whether external (locomotion) or internal (molecular and cellular processes), is indeed a defining characteristic of living organisms. This statement is correct.

Additional Information

• Plant Movements:

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• Phototropism: Movement of plants toward light due to auxin distribution.
• Geotropism: Movement of roots toward gravity, aiding in nutrient absorption.
• Nastic Movements: Non-directional responses to stimuli such as touch (e.g., Mimosa pudica).
• Hydrotropism: Movement of roots toward water sources for survival and growth.
• Molecular Movement in Plants:
• Photosynthesis: Molecular movement of carbon dioxide, water, and glucose within plant cells.
• Xylem and Phloem Transport: Movement of nutrients, water, and food across plant tissues.
• Cytoplasmic Streaming: Movement of organelles and molecules within cells for efficient functioning.
• Stomatal Regulation: Molecular movement of gases like oxygen and carbon dioxide through stomata.
• Characteristics of Living Organisms:
• Respiration: Involves molecular movement of oxygen and carbon dioxide.
• Growth: Cellular and molecular processes aid in development.
• Reproduction: Molecular movement in gamete formation and fertilization.
• Excretion: Movement of waste molecules from cells to the outside environment.

Important Points

• Types of Movement in Living Organisms:
• External Movement: Includes locomotion like walking, swimming, or flying.
• Internal Movement: Includes processes like blood circulation, digestion, and cellular transport.
• Role of Hormones:
• Auxins: Promote growth-related movements in plants.
• Adrenaline: Facilitates movement during stress in animals.
• Examples of Plant Molecular Movement:
• Transpiration: Movement of water vapor out of stomata.
• Nutrient Uptake: Absorption of minerals and water through roots.

Q16. Answer: (a) Contract and make the lens thicker

The correct answer is Contract and make the lens thicker.

Key Points

• The ciliary muscles are a part of the eye responsible for adjusting the shape of the lens to focus on objects at different distances. This process is called accommodation.
• When a person looks at a nearby object, the ciliary muscles contract, reducing the tension on the suspensory ligaments (zonules of Zinn).
• This relaxation of the suspensory ligaments allows the lens to become thicker and more convex, increasing its refractive power to focus light precisely on the retina.
• The ability of the lens to become thicker is crucial for focusing on objects that are close to the eye, such as while reading or looking at a smartphone screen.
• This process ensures clear vision for nearby objects by increasing the focal length of the lens. Hence, the statement "Contract and make the lens thicker" is correct.

Additional Information

• Function of Ciliary Muscles:
• The ciliary muscles are smooth muscles within the eye located around the lens and are controlled by the autonomic nervous system.
• They are responsible for controlling the lens curvature to enable focusing on objects at varying distances.
• When focusing on distant objects, the ciliary muscles relax, allowing the lens to become thinner and less convex.
• When focusing on nearby objects, the ciliary muscles contract, allowing the lens to become thicker and more convex.
• Accommodation Mechanism:
• The process of accommodation refers to the eye's ability to adjust the lens shape to focus light from objects at different distances.
• It involves the ciliary muscles, suspensory ligaments, and the lens working together.
• For nearby objects, the lens becomes thicker to increase its refractive power, and for distant objects, the lens becomes thinner to reduce refractive power.
• Explanation of Incorrect Options:
• Relax and make the lens thicker: This is incorrect because relaxation of the ciliary muscles causes the lens to become thinner,

not thicker.

• Contract and make the lens thinner: This is incorrect because contraction of the ciliary muscles allows the lens to become thicker, not thinner.

• Relax and make the lens thinner: This is correct only for distant vision and not for nearby objects.

• Relevance of Accommodation:

• The process of accommodation is essential for day-to-day activities such as reading, writing, and recognizing objects at different distances.

• Issues with accommodation can lead to conditions such as presbyopia, where the lens loses flexibility with age, or myopia and hyperopia, where the eye's focusing ability is impaired.

Important Points

• The near point of the human eye (the closest distance at which the eye can focus on an object) is approximately 25 cm for a normal young adult.

• The far point (the farthest distance at which the eye can focus) is theoretically infinity for a normal eye.

• Accommodation diminishes with age due to the loss of elasticity in the lens, a condition known as presbyopia, which typically begins around the age of 40 years.

• Accommodation is controlled by the parasympathetic nervous system, which activates the contraction of ciliary muscles.

• Some optical devices, such as reading glasses or contact lenses, are used to correct accommodation defects like presbyopia or myopia.

Q17. Answer: (a) The gas is carbon dioxide; the solid is either a carbonate or bicarbonate.

The correct answer is The gas is carbon dioxide; the solid is either a carbonate or bicarbonate..

Key Points

• The reaction of a white solid with dilute hydrochloric acid (HCl) producing a gas that turns lime water milky confirms the gas is carbon dioxide (CO2). This is a characteristic test for carbon dioxide.

• Lime water (calcium hydroxide solution) reacts with carbon dioxide to form calcium carbonate (CaCO3), which appears as a milky precipitate. This confirms the presence of carbon dioxide. Hence, this statement is correct.

• The white solid reacting with dilute HCl to release carbon dioxide indicates that the solid is either a carbonate (CO3^(2-)) or a bicarbonate (HCO3^-). Both compounds react with acids to release CO2. Hence, this statement is correct.

• While the gas is confirmed as carbon dioxide, the exact identity of the solid (e.g., calcium carbonate, sodium bicarbonate, etc.) cannot be determined solely from this reaction. Further tests would be required to specify the compound. Hence, the statement about the solid being calcium carbonate alone is incorrect.

• The reaction does not involve hydrogen gas or any reactive metal. Hydrogen is released when acids react with metals, but this is not the case here. Hence, this statement is incorrect.

Additional Information

• Carbonates and Bicarbonates:

• Carbonates (e.g., CaCO3, Na2CO3) and bicarbonates (e.g., NaHCO3) are compounds containing carbonate ions (CO3^(2-)) or bicarbonate ions (HCO3^-).

• When these compounds react with acids, they release carbon dioxide gas according to the reactions:

• Carbonate: CO3^(2-) + 2H^+ → CO2 + H2O

• Bicarbonate: HCO3^- + H^+ → CO2 + H2O

• Lime Water Test:

• The lime water test is a standard chemical test for the identification of carbon dioxide gas.

• When carbon dioxide is bubbled through lime water (Ca(OH)2 solution), it reacts to form calcium carbonate (CaCO3), which is insoluble in water and appears as a milky precipitate:

• Ca(OH)2 + CO2 → CaCO3 + H2O

• If excess CO2 is passed, the milkiness disappears as calcium carbonate reacts with water and carbon dioxide to form calcium bicarbonate, which is soluble in water:

• CaCO3 + H2O + CO2 → Ca(HCO3)2

• Difference Between Carbonates and Bicarbonates:

• Carbonates contain CO3^(2-) ions, while bicarbonates contain HCO3^- ions.

• Both types of compounds react with acids to release CO2 gas, but bicarbonates require only one H^+ ion per molecule, while carbonates require two.

• Common Applications:

• Calcium carbonate (CaCO3) is used in construction (as limestone), manufacturing (as a raw material for cement), and as an antacid in medicine.

• Sodium bicarbonate (NaHCO3), commonly known as baking soda, is widely used in baking, cleaning, and as an antacid.
• Key Experiment Details:
• The reaction between acids and carbonates/bicarbonates is an example of a gas-evolution reaction.
• Such reactions are often used in laboratories to identify unknown compounds.

Q18. Answer: (a) Trophic level

The correct answer is Trophic level.

Key Points

• Each step in a food chain represents a trophic level. It defines the position of an organism in the flow of energy and nutrients in an ecosystem.
• The first trophic level consists of producers, such as plants, which convert solar energy into chemical energy through photosynthesis.
• The second trophic level includes primary consumers, typically herbivores, which feed on producers for energy.
• Secondary consumers occupy the third trophic level and are carnivores or omnivores that eat primary consumers.
• The fourth trophic level and beyond consist of tertiary consumers, which are predators feeding on secondary consumers. Energy transfer diminishes as it progresses through the levels due to the 10% energy rule.

Additional Information

• Food Chain:
• A food chain is a sequence of organisms through which energy and nutrients flow, starting with producers and ending with top predators.
• Examples: Grass → Grasshopper → Frog → Snake → Hawk.
• Food chains are linear and show a single pathway of energy flow.
• Trophic Levels:
• Trophic levels are hierarchical steps in a food chain that represent an organism's position in the ecosystem's energy flow.
• There are usually 4 to 5 trophic levels in an ecosystem due to energy loss at each level.
• Energy transfer between levels follows the 10% energy rule, which states that only 10% of energy is passed on to the next level, while the rest is lost as heat.
• Stratosphere Level:
• The stratosphere is a layer of Earth’s atmosphere above the troposphere, extending from about 10 to 50 km altitude.
• It contains the ozone layer, which absorbs harmful ultraviolet radiation from the sun.
• It is unrelated to food chains or trophic levels.
• Troposphere Level:
• The troposphere is the lowest layer of Earth’s atmosphere, where weather phenomena occur and life exists.
• It extends up to about 10 km above sea level.
• It does not correspond to food chains or trophic levels.
• Ozone Layer:
• The ozone layer, located in the stratosphere, protects Earth from harmful ultraviolet (UV) radiation.
• It plays no role in food chains or the concept of trophic levels.

Important Points

• Energy Pyramid:
• It represents the flow of energy through trophic levels in a food chain.
• The base of the pyramid consists of producers, while the apex represents top predators.
• Energy decreases as it moves upward due to the 10% rule.
• Significance of Trophic Levels:
• They help in understanding energy distribution and ecosystem health.
• Any disruption in one level affects the entire food chain.

Q19. Answer: (a) 16X J

The correct answer is 16X J.

Key Points

• Kinetic Energy Formula: The kinetic energy (KE) of a body is calculated using the formula KE = (1/2)mv², where m is the mass of the body and v is its velocity.
• Initial Kinetic Energy: When the velocity of the body is v, the kinetic energy is given as ‘X’ joules. This implies X = (1/2)mv².

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• Velocity Changes to 4v: If the velocity of the body increases to 4v, the new kinetic energy becomes KE = (1/2)m(4v)² = (1/2)m(16v²).

• Relation Between Old and New KE: The new kinetic energy is 16 times the initial kinetic energy. Therefore, the new kinetic energy equals 16X joules.

• Correct Option: The correct answer is 16X J, as the kinetic energy increases by a factor of 16 when the velocity is quadrupled.

Additional Information

• Kinetic Energy and Velocity Relationship: Kinetic energy is directly proportional to the square of the velocity. When velocity is increased, the kinetic energy increases quadratically (v²).

• Implications of Velocity Increase: For example, doubling the velocity increases the kinetic energy by a factor of 4, tripling it increases by a factor of 9, and quadrupling it increases by a factor of 16.

• Units of Kinetic Energy: The SI unit of kinetic energy is joules (J), where 1 joule is equivalent to the energy transferred when 1 newton of force moves an object by 1 meter.

• Examples of Kinetic Energy: Kinetic energy is observed in moving objects like vehicles, flowing water, flying airplanes, and falling objects. For instance, a faster-moving car has more kinetic energy than a slower one.

• Conservation of Energy: Kinetic energy is a part of the total mechanical energy, which is conserved in closed systems unless external forces like friction or air resistance act on the object.

Important Points

• Mathematical Derivation: KE = (1/2)m(4v)² simplifies to KE = (1/2)m × 16v² = 16 × (1/2)mv² = 16X.

• Energy Doubling Rule: If the velocity doubles, the kinetic energy increases fourfold. This principle is crucial in understanding energy dynamics in physics.

• Applications: The concept of kinetic energy is used in designing vehicles, calculating energy requirements for motion, and analyzing impacts during collisions.

• Practical Implications: In real-world scenarios, increased velocity leads to higher energy consumption and greater potential for damage in collisions.

Q20. Answer: (b) Both low melting and boiling point

The correct answer is Both low melting and boiling point.

Key Points

• Covalent bonding occurs when atoms share electrons to achieve stability, forming molecules. Carbon compounds exhibit covalent bonding, leading to specific physical properties.

• Carbon compounds generally have low melting and boiling points because covalent bonds are strong within molecules, but the intermolecular forces (like van der Waals forces) are weak. Hence, these compounds do not require much energy to change their state.

• Covalent compounds, including carbon-based molecules, are typically poor conductors of electricity because they lack free ions or electrons to carry the charge.

• The low melting and boiling points of carbon compounds are a result of their molecular structure and weak intermolecular forces, distinguishing them from ionic compounds with higher melting and boiling points.

• These properties make carbon compounds suitable for applications in organic chemistry, biochemistry, and materials science.

Additional Information

• Covalent Bonding:

• Covalent bonds are formed by the sharing of electrons between atoms to achieve a stable electron configuration (often a full outer shell).

• The strength of covalent bonds depends on the number of shared electron pairs; single bonds are weaker than double or triple bonds.

• Examples of covalent compounds include methane (CH4), water (H2O), and carbon dioxide (CO2).

• Properties of Covalent Compounds:

• Low melting and boiling points: Due to weak intermolecular forces between molecules, covalent compounds require less energy to break these forces.

• Poor electrical conductivity: Covalent compounds do not have free ions or electrons, making them insulators.

• Solubility: Covalent compounds are typically soluble in nonpolar solvents like benzene but insoluble in polar solvents like water.

• Carbon Compounds:

• Carbon compounds form the basis of organic chemistry and are found in living organisms.

• Examples include hydrocarbons, alcohols, ketones, and carboxylic acids.

• Carbon's ability to form stable covalent bonds with itself and other elements (like hydrogen, oxygen, nitrogen) allows for a diverse range of compounds.

• Comparison with Ionic Compounds:
• Ionic compounds: High melting and boiling points due to strong electrostatic forces between ions.
• They generally conduct electricity in molten or dissolved states because of free-moving ions.
• Covalent compounds differ significantly due to weaker intermolecular forces and lack of ions.

Important Points

• Applications of Carbon Compounds:
• Medicinal Chemistry: Carbon-based compounds like drugs and antibiotics play a pivotal role in healthcare.
• Material Science: Polymers and plastics are carbon-based covalent compounds widely used in industry.
• Energy Sources: Hydrocarbons, such as methane and petroleum, serve as major energy resources.
• Biological Importance: Carbon compounds like carbohydrates, proteins, and nucleic acids are essential for life processes.
• Facts about Carbon:
• Carbon is the sixth element in the periodic table with an atomic number of 6.
• It is unique due to its ability to form long chains and rings through covalent bonding.
• Carbon exists in various allotropes, including diamond, graphite, and fullerenes, showcasing its versatility.

Q21. Answer: (a) Spore formation is a type of fragmentation process

The correct answer is Option 1: Spore formation is a type of fragmentation process..

Key Points

• Fragmentation is a type of asexual reproduction where an organism splits into fragments, and each fragment develops into a new organism. This statement is correct.
• Spore formation is not a type of fragmentation but is an entirely different method of asexual reproduction. In spore formation, organisms produce spores that germinate under favorable conditions to form new individuals. Hence, Option 1 is incorrect.
• Fragmentation leads to the production of genetically identical offspring because it involves cloning the parent's genetic material. This statement is correct.
• Fragmentation occurs mainly in multicellular organisms such as algae, fungi, and certain plants. It is less common in animals. This statement is correct.
• In fragmentation, the organism often undergoes maturation before splitting into fragments that are capable of developing into fully functional individuals. This statement is correct.

Additional Information

• Fragmentation:
• Occurs in organisms like spirogyra, planaria, and certain fungi.
• It is a common reproduction method in aquatic environments where external environmental factors like water currents help in dispersing the fragments.
• Spore Formation:
• Spore formation is a reproductive method seen in fungi, bacteria, and certain plants like ferns and mosses.
• It involves the production of specialized cells called spores, which are resistant to unfavorable conditions and germinate when conditions improve.
• Asexual Reproduction:
• Involves a single parent and produces offspring that are genetically identical to the parent.
• Common types include binary fission, budding, fragmentation, and spore formation.
• Advantages of Fragmentation:
• Allows rapid reproduction in favorable environments.
• Ensures genetic uniformity, which can be beneficial in stable conditions.

Important Points

• Fragmentation vs Spore Formation:
• Fragmentation involves splitting of the organism's body, while spore formation involves the release of specialized reproductive cells.
• Fragmentation is common in multicellular organisms like spirogyra, whereas spore formation is seen in organisms like fungi and mosses.
• Examples:
• Fragmentation: Spirogyra (a type of algae), Planaria (a flatworm).
• Spore Formation: Rhizopus (a type of fungus), Ferns (plants).

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Q22. Answer: (b) NaHCO3

The correct answer is NaHCO3.

Key Points

• Baking soda is chemically known as sodium bicarbonate and has the chemical formula NaHCO3. It is widely used in cooking, cleaning, and various household applications.

• It is a white crystalline compound that appears as a fine powder. It is slightly alkaline in nature and releases carbon dioxide when heated or mixed with an acid.

• When used in baking, baking soda acts as a leavening agent. It reacts with acidic components in the dough (e.g., buttermilk, vinegar) to produce carbon dioxide, causing the dough to rise.

• In addition to cooking, sodium bicarbonate is used for cleaning due to its mild abrasive nature and ability to neutralize odors.

• Baking soda is also utilized in medicine as an antacid to treat indigestion and heartburn by neutralizing stomach acid.

Additional Information

• Other Chemical Formulas Mentioned:

• NaCl (Sodium Chloride): Commonly known as table salt, NaCl is used in cooking, preserving food, and various industrial processes.

• Na2CO3 (Sodium Carbonate): Also known as washing soda, it is used in cleaning agents, glass manufacturing, and as a water softener.

• NaOH (Sodium Hydroxide): Commonly called caustic soda, it is a strong alkali used in soap making, paper production, and chemical manufacturing.

• Properties of NaHCO3:

• It is a mild base and reacts with acids to release carbon dioxide gas.

• The decomposition of NaHCO3 occurs at temperatures above 50°C, producing sodium carbonate (Na2CO3), water (H2O), and carbon dioxide (CO2).

• It is water-soluble and has a slightly alkaline pH of approximately 8.3 in solution.

• Applications:

• Cooking: Used in baking to make cakes and bread fluffy by releasing carbon dioxide gas during the reaction.

• Cleaning: Acts as a deodorizer and a mild abrasive for cleaning surfaces.

• Medical Use: Treats acid indigestion and heartburn by neutralizing excess stomach acid.

• Fire Extinguishers: Used in dry chemical fire extinguishers as it releases CO2, which helps suppress flames.

• Environmental Benefits: Sodium bicarbonate is an environmentally friendly compound and is safe for use in households.

Important Points

• Safe Usage: Baking soda is generally safe to use but should be handled with care in large quantities as excessive ingestion can cause alkalosis.

• Storage: Sodium bicarbonate should be stored in a cool, dry place to prevent clumping and loss of efficacy.

• History: Sodium bicarbonate has been in use since ancient times and was first produced commercially in the late 18th century by French chemist Nicolas Leblanc.

Q23. Answer: (b) 0.75 A

The correct answer is 0.75 A.

Key Points

• The power formula in electrical engineering is derived from Ohm's Law and is given by the equation: P = V × I, where:

• P: Power in watts (W)

• V: Voltage in volts (V)

• I: Current in amperes (A)

• To find the current drawn by a device, the formula is rearranged as: I = P / V.

• In this case, the power rating of the device is 90 W, and the voltage is 120 V.

• Substituting these values into the formula, we get:

• I = 90 W / 120 V

• I = 0.75 A

• Hence, the device draws a current of 0.75 A.

Additional Information

• Power (P):

• It represents the rate at which electrical energy is consumed or converted into another form, such as heat, light, or mechanical energy.

• The SI unit of power is the watt (W).
• Voltage (V):
• Voltage is the potential difference between two points in an electrical circuit.
• It drives the flow of electric current, and its SI unit is the volt (V).
• Current (I):
• Electric current is the flow of electric charge through a conductor.
• The SI unit of current is the ampere (A).
• Ohm's Law:
• Ohm's Law states that the current flowing through a conductor is directly proportional to the voltage across it and inversely proportional to the resistance.
• The formula is: V = I × R, where R is resistance in ohms (Ω).
• Common Applications:
• The calculation of current, power, and voltage is crucial in designing and using electrical devices like heaters, fans, and bulbs.
• For example, if a bulb is rated at 60 W and operates at 220 V, the current drawn can be calculated to ensure it works safely within circuit limits.

Important Points

• Electrical Safety:
• Understanding current and voltage ratings is critical to prevent overloading circuits or causing electrical fires.
• Devices should always be used within their specified voltage and current limits.
• Power Efficiency:
• Devices with higher efficiency consume less power for the same output, making them cost-effective and environmentally friendly.
• For example, LED lights consume less power compared to incandescent bulbs while providing the same brightness.
• Measurement Tools:
• Devices like multimeters are used to measure voltage, current, and resistance in circuits.
• They are essential tools for electricians and engineers to diagnose and repair electrical issues.

Q24. Answer: (c) Double

The correct answer is Double.

Key Points

• Gravitational Force Formula: The gravitational force between two objects is given by Newton's Law of Universal Gravitation: F = G × (m1 × m2) / r², where:
• F is the gravitational force.
• G is the gravitational constant (approximately 6.674 × 10^-11 N·m²/kg²).
• m1 and m2 are the masses of the two objects.
• r is the distance between the centers of the two objects.
• - This law states that every particle in the universe attracts every other particle with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.
• It is one of the fundamental laws in physics and helps explain phenomena such as planetary motion and tides.
• Gravitational Constant (G):
• The gravitational constant (G) has a fixed value of approximately 6.674 × 10^-11 N·m²/kg².
• It is a universal constant used in calculations of gravitational forces across the cosmos.
• Impact of Distance:
• The gravitational force is inversely proportional to the square of the distance between two objects. If the distance increases, the force decreases significantly.
• In this scenario, the distance remains constant, ensuring that only mass changes affect the force.
• Real-World Applications:
• Gravitational forces are crucial in understanding orbital mechanics, satellite launches, and space exploration.
• The moon's gravitational interaction with Earth also influences tides and stabilizes Earth's axial tilt.

Important Points

• Gravitational Force in Space: Gravitational force governs the motion of celestial bodies, including planets, moons, and stars.
• Tides on Earth: The gravitational interaction between the Earth and the moon causes tides, with the moon's gravity pulling ocean waters toward it.
• Doubling Mass Impact: Doubling the mass of any celestial object significantly alters gravitational interactions and may affect

orbital stability.

Q25. Answer: (d) ρ/a

The correct answer is ρ/a.

Key Points

• Resistance Formula: The resistance between two opposite faces of a cube is calculated using the formula: R = ρ × L/A, where:

• ρ is the resistivity of the material.

• L is the length of the cube (distance between the faces).

• A is the cross-sectional area of the face through which current flows.

• Dimensions of the Cube: For a cube of side a:

• The length L between two opposite faces is a.

• The cross-sectional area A is a^2 (area of the square face).

• Resistance Calculation: Substituting the cube dimensions into the resistance formula:

• $R = \rho \times a / a^2$

• $R = \rho / a$

Hence, the resistance between the opposite faces of the cube is ρ/a.

• Correct Option: Among the provided options, only ρ/a (Option 4) matches the calculated resistance.

Additional Information

• Resistivity (ρ):

• Resistivity is an intrinsic property of a material that quantifies its ability to resist the flow of electric current.

• It is measured in ohm-meters (Ω·m).

• Materials with low resistivity are good conductors (e.g., copper, silver), while those with high resistivity are insulators (e.g., rubber, glass).

• Resistance (R):

• Resistance is the opposition to the flow of electric current through a material.

• It depends on the material's resistivity, length of the conductor, and cross-sectional area.

• Unit of resistance is ohms (Ω).

• Factors Affecting Resistance:

• Length: Resistance increases with an increase in the length of the conductor.

• Cross-sectional Area: Resistance decreases with an increase in cross-sectional area.

• Material: Resistance depends on the material's resistivity (ρ).

• Applications of Resistance Calculations:

• Used in designing electrical circuits and components like resistors.

• Helps in determining the energy loss in transmission lines.

• Critical in material science for understanding the properties of conductive and insulating materials.

Important Points

• Special Case of a Cube:

• When the shape of the object is a regular cube, the symmetry simplifies the calculation of resistance.

• Resistance between opposite faces depends only on the resistivity and side length, as shown in the formula R = ρ/a.

• Practical Examples:

• Resistance measurements of semiconductor crystals shaped like cubes.

• Electrical resistance in small-scale materials used in research and development.

Q26. Answer: (b) 19.4%

Shortcut Trick

Apply Successive Percentage formula: Net Change = a + b + (a × b)/100

Where a = +30% (Mark up) and b = −38% (Discount).

Net change = 30 − 38 + (30 × −38)/100 = −8 − 11.4 = −19.4%

Negative sign indicates a loss.

Therefore The correct answer is 19.4%.

Alternate Method

Given: Mark-up = 30%, Discount = 38%

Formula: SP = CP × (100 + Mark-up%)/100 × (100 − Discount%)/100
=> Let Cost Price (CP) = 100
=> Marked Price (MP) = 100 + 30% of 100 = 130
=> Selling Price (SP) = 130 − 38% of 130
=> SP = 130 − (38/100 × 130) = 130 − 49.4 = 80.6
=> Loss = CP − SP = 100 − 80.6 = 19.4
=> Loss Percentage = (19.4 / 100) × 100 = 19.4%
Therefore The correct answer is 19.4%.
Additional Information
Mark-up and Discount Relation
Profit/Loss% is the resultant of Mark-up% and Discount%. Formula: MP/CP = (100 + P%)/(100 − D%).
Successive Discount
If two discounts d1 and d2 are given, equivalent discount = d1 + d2 − (d1 × d2)/100.
Marked Price
MP is always calculated on CP, while Discount is always calculated on MP to arrive at the SP.

Q27. Answer: (b) 15/17

Given:
cos θ = 8 ÷ 17
Formula Used:
$\sin^2\theta + \cos^2\theta = 1$
$\sin\theta = \sqrt{(1 - \cos^2\theta)}$
Calculation:
=> $\cos^2\theta = (8 \div 17)^2 = 64 \div 289$
=> $\sin\theta = \sqrt{(1 - 64 \div 289)}$
=> $\sin\theta = \sqrt{(225 \div 289)}$
=> $\sin\theta = 15 \div 17$
Therefore The correct answer is 15 ÷ 17.

Q28. Answer: (a) 45

Given:
17 × 684 ÷ 57 − (5/7) × 4.2 = x + 13 × 204 ÷ 17
Formula Used:
BODMAS rule
Calculation:
=> 17 × 684 ÷ 57 = 17 × 12 = 204
=> (5 ÷ 7) × 4.2 = (5 ÷ 7) × (42 ÷ 10) = 210 ÷ 70 = 3
=> LHS = 204 − 3 = 201
=> 13 × 204 ÷ 17 = 13 × 12 = 156
=> 201 = x + 156
=> x = 201 − 156
=> x = 45
Therefore The correct answer is 45.

Q29. Answer: (a) 32 km/hr

Shortcut Trick
When two equal halves of a distance are covered at speeds x and y, the Average Speed is the Harmonic Mean of the speeds.
Average Speed = (2 × x × y) ÷ (x + y)
Average Speed = (2 × 20 × 80) ÷ (20 + 80) = 3200 ÷ 100 = 32 km/hr.
Therefore The correct answer is 32 km/hr.
Alternate Method
Given:
Speed of first half (v1) = 20 km/hr

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Speed of second half (v2) = 80 km/hr

Formula Used:

Average Speed = Total Distance ÷ Total Time

Calculations:

Let the total distance be 160 km (LCM of 20 and 80 for easy calculation).

=> First half distance = 80 km, Second half distance = 80 km

=> Time for first half (t1) = 80 ÷ 20 = 4 hours

=> Time for second half (t2) = 80 ÷ 80 = 1 hour

=> Total Time = 4 + 1 = 5 hours

=> Average Speed = 160 ÷ 5 = 32 km/hr

Therefore The correct answer is 32 km/hr.

Additional Information

General Average Speed Formula

For any distance and speed combination, use Average Speed = (d1 + d2 + ...) ÷ (t1 + t2 + ...).

Average Speed for Equal Time Intervals

If a body travels at speed v1 for time t and speed v2 for the same time t, Average Speed = (v1 + v2) ÷ 2.

Relative Speed

In opposite directions, relative speed = s1 + s2. In the same direction, relative speed = |s1 − s2|.

Q30. Answer: (b) 11

Shortcut Trick

Combined efficiency of A and B = 1/5

Efficiency of B alone = 1/55

Efficiency of A = 1/5 − 1/55 = 10/55 = 2/11

Time for A to do single work = 11/2 days

Time for A to do double the work = (11/2) × 2 = 11 days

Therefore The correct answer is 11 days.

Alternate Method

Given: A + B = 5 days, B = 55 days.

Formula Used: Total Work = LCM of time taken; Efficiency = Total Work ÷ Time.

Person	Days	Total Work	Efficiency
A + B	5	55	11
B	55	1	

=> Efficiency of A = (Efficiency of A + B) − (Efficiency of B)

=> Efficiency of A = 11 − 1 = 10 units/day

=> Double the work = 55 × 2 = 110 units

=> Time taken by A alone = 110 ÷ 10 = 11 days

Therefore The correct answer is 11 days.

Additional Information

Work and Efficiency Relationship

Time taken is inversely proportional to efficiency. If the amount of work is doubled, the time taken also doubles for a constant efficiency.

Combined Work Formula

If A takes 'x' days and B takes 'y' days, together they take (x × y) ÷ (x + y) days to complete the same work.

Q31. Answer: (c) 31 : 17

Shortcut Trick

Total age 20 years ago = 96 − (20 × 2) = 56 years.

Ratio 20 years ago = 3 : 1 (Total units = 4).

Son (20 yrs ago) = 56 ÷ 4 = 14; Father (20 yrs ago) = 14 × 3 = 42.

Present Ages: Son = 14 + 20 = 34; Father = 42 + 20 = 62.

Present Ratio = 62 : 34 = 31 : 17.
Therefore The correct answer is 31 : 17.
Alternate Method
Given: Sum of present ages = 96. 20 years ago, Father = 3 × Son.
=> Let age of Son 20 years ago be x and Father be 3x.
=> Present age of Son = x + 20
=> Present age of Father = 3x + 20
=> (3x + 20) + (x + 20) = 96
=> 4x + 40 = 96 => 4x = 56 => x = 14
=> Father's present age = 3(14) + 20 = 42 + 20 = 62 years
=> Son's present age = 14 + 20 = 34 years
=> Required Ratio = 62 : 34 = 31 : 17
Therefore The correct answer is 31 : 17.
Additional Information
Age Gap Consistency
The difference between the ages of two people remains constant regardless of the number of years passed.
Sum of Ages Shift
If there are 'n' people, their total sum of ages increases or decreases by (n × number of years) over time.
Ratio Application
Always define variables at the point in time where the ratio is given to simplify the linear equations.

Q32. Answer: (c) 11250

Shortcut Trick
If the sum of three variables x + y + z = 0, then the identity $x^3 + y^3 + z^3 = 3xyz$ holds true.
Check: −15 + 25 + (−10) = 25 − 25 = 0.
Value = 3 × (−15) × 25 × (−10)
Value = 3 × 3750 = 11250.
Therefore The correct answer is 11250.
Alternate Method
Given: x = −15, y = 25, z = −10
Formula Used: $x^3 + y^3 + z^3 - 3xyz = (x + y + z)(x^2 + y^2 + z^2 - xy - yz - zx)$
Calculations:
=> Calculate the sum of the given values: x + y + z = −15 + 25 + (−10)
=> x + y + z = 25 − 25 = 0
=> Substituting (x + y + z) = 0 into the algebraic identity:
=> $x^3 + y^3 + z^3 - 3xyz = 0 \times (x^2 + y^2 + z^2 - xy - yz - zx)$
=> $x^3 + y^3 + z^3 - 3xyz = 0$
=> $x^3 + y^3 + z^3 = 3xyz$
=> Value = 3 × (−15) × 25 × (−10)
=> Value = 3 × 3750 = 11250
Therefore The correct answer is 11250.
Additional Information
Cubic Identity Condition
The expression $x^3 + y^3 + z^3$ is equal to 3xyz if and only if x + y + z = 0 or x = y = z.
Standard Algebraic Identity
$x^3 + y^3 + z^3 - 3xyz = (x + y + z) \times [1/2 \times ((x - y)^2 + (y - z)^2 + (z - x)^2)]$.
Sum of Squares Identity
$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$, which is often used in conjunction with cubic identities.

Q33. Answer: (a) 57 : 22

Shortcut Trick
Equate the common teal tokens by multiplying the ratios.

Teal : Maroon = 15 : 10 = 3 : 2 (Multiplied by 11 → 33 : 22)

Lime : Teal = 19 : 11 (Multiplied by 3 → 57 : 33)

Ratio Lime : Maroon = 57 : 22

Therefore The correct answer is 57 : 22.

Alternate Method

Given ratio of Teal (T) to Maroon (M) = 15 : 10 = 3 : 2

Given ratio of Lime (L) to Teal (T) = 19 : 11

To find the combined ratio, we make the value of Teal equal in both ratios.

=> LCM of Teal values (3 and 11) = 33

=> T : M = (3 × 11) : (2 × 11) = 33 : 22

=> L : T = (19 × 3) : (11 × 3) = 57 : 33

=> L : T : M = 57 : 33 : 22

=> L : M = 57 : 22

Therefore The correct answer is 57 : 22.

Additional Information

Compound Ratio

When two or more ratios are multiplied term by term, the resulting ratio is called a compound ratio. If a:b and c:d are two ratios, the compound ratio is (ac):(bd).

Equating the Common Term

To combine ratios like A:B and B:C, identify the common element (B) and find the LCM of its numerical values to normalize the entire expression.

Q34. Answer: (b) {8 cm, 9 cm, 4 cm}

Shortcut Trick

To determine if three numbers can form the sides of a triangle, check if the sum of the two smaller sides is greater than the largest side.

1) 8 + 2 = 10 (Not greater than 10) → Invalid

2) 8 + 4 = 12 (12 > 9) → Valid

3) 9 + 12 = 21 (Not greater than 22) → Invalid

4) 5 + 6 = 11 (Not greater than 11) → Invalid

Therefore The correct answer is {8 cm, 9 cm, 4 cm}.

Alternate Method

Given: Four sets of potential side lengths for a triangle.

Property Used: According to the Triangle Inequality Theorem, for any triangle with sides a, b, and c: a + b > c, a + c > b, and b + c > a.

Testing each option based on the sum of the two smaller sides:

=> Option 1: 10, 8, 2 → 2 + 8 = 10. Since 10 is not greater than 10, it forms a straight line (degenerate triangle).

=> Option 2: 8, 9, 4 → 4 + 8 = 12. Since 12 > 9, these sides can form a triangle.

=> Option 3: 9, 12, 22 → 9 + 12 = 21. Since 21 is less than 22, the sides cannot meet to form a closed figure.

=> Option 4: 5, 6, 11 → 5 + 6 = 11. Since 11 is not greater than 11, it forms a straight line.

Therefore The correct answer is {8 cm, 9 cm, 4 cm}.

Additional Information

Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle is always strictly greater than the length of the third side.

Difference of Sides Property

The absolute difference between any two sides of a triangle is always less than the length of the third side: $|a - b| < c$.

Types of Triangles by Sides

Scalene: All sides different. Isosceles: Two sides equal. Equilateral: All three sides equal.

Q35. Answer: (b) Rs. 200

Shortcut Trick

Use the Successive Multiplier method:

Let Manufacturing Cost = C

C × (1.20) × (1.25) × (1.24) = 372
C × 6/5 × 5/4 × 31/25 = 372
C × 3/2 × 31/25 = 372 => C × 93/50 = 372 => C = 4 × 50 = 200
Therefore The correct answer is Rs. 200.
Alternate Method
Given:
Manufacturer Profit = 20% | Wholesaler Profit = 25% | Retailer Profit = 24%
Retailer Selling Price = Rs. 372
Let Manufacturing Cost be x.
=> Price for Wholesaler = x × (120/100) = 1.2x
=> Price for Retailer = 1.2x × (125/100) = 1.2x × 1.25 = 1.5x
=> Price for Customer (Retailer SP) = 1.5x × (124/100) = 372
=> 1.5x × 1.24 = 372
=> 1.86x = 372
=> x = 372 ÷ 1.86
=> x = 200
Therefore The correct answer is Rs. 200.
Additional Information
Successive Percentage Formula
For two successive changes of a% and b%, effective change = [a + b + (ab/100)]%.
Profit and Loss Relation
Selling Price (SP) = Cost Price (CP) × (100 + Profit%)/100. For a chain of sales, final SP = Initial CP × MF1 × MF2 × ...
Base Change Rule
If the price increases by x%, to return to the original price, the value must decrease by [x/(100+x)] × 100%.

Q36. Answer: (d) 16.07%

Shortcut Trick
Discount % = [Free Items ÷ Total Items (Paid + Free)] × 100
Discount % = [9 ÷ (47 + 9)] × 100
Discount % = (9 ÷ 56) × 100 ≈ 16.07%
Therefore The correct answer is 16.07%.
Alternate Method
Given:
Number of Paid Items = 47
Number of Free Items = 9
Formula Used:
Discount % = (Free Items ÷ Total Items) × 100
Calculations:
=> Total items given to customer = 47 + 9 = 56 items
=> Let Marked Price (MP) of each item = Rs. 1
=> Total Marked Price of 56 items = Rs. 56
=> Selling Price (SP) = Price of 47 items = Rs. 47
=> Discount Amount = MP − SP = 56 − 47 = Rs. 9
=> Discount % = (9 ÷ 56) × 100
=> Discount % = 900 ÷ 56 = 16.0714...
Therefore The correct answer is 16.07%.
Additional Information
Buy X Get Y Free
The effective discount is calculated on the total number of items (X+Y) carried home by the customer, not just the paid ones.
Successive Discounts
If two discounts a% and b% are given, total discount = [a + b − (ab/100)]%.
Marked Price (MP)

MP = CP × [100 + Profit% / 100 − Discount%], relating Cost Price and Marked Price directly.

Q37. Answer: (a) 3

Shortcut Trick

Average earnings per worker = 400 ÷ 5 = Rs. 80

Using Alligation: (Skilled Rs. 100) vs (Unskilled Rs. 50) with Mean Rs. 80

Ratio of workers = (80 − 50) : (100 − 80) = 30 : 20 = 3 : 2

Total units (3 + 2) = 5 workers. Since total workers are 5, 1 unit = 1 worker.

Therefore The correct answer is 3.

Alternate Method

Given: Daily wage of skilled worker = Rs. 100, unskilled worker = Rs. 50.

Formula: Total Earnings = (Skilled × 100) + (Unskilled × 50)

=> Let the number of skilled workers be x.

=> Then unskilled workers = (5 − x).

=> (x × 100) + ((5 − x) × 50) = 400

=> 100x + 250 − 50x = 400

=> 50x = 400 − 250

=> 50x = 150

=> x = 150 ÷ 50 = 3

Therefore The correct answer is 3.

Additional Information

Alligation Rule

The ratio of the weights of two components is the inverse ratio of the differences of their values from the mean value: (Value2 − Mean) : (Mean − Value1).

Weighted Average

The average value of a group where different items have different weights: A = (n1w1 + n2w2) ÷ (n1 + n2).

Q38. Answer: (d) 0.99

Shortcut Trick

In Percentage, any value X is considered 100% of itself.

Subtracting 1% from 100% gives 99%.

In decimal form, 99% is equal to 0.99.

Therefore The correct answer is 0.99.

Alternate Method

Given: Original value is X. Percentage to subtract is 1% of X.

=> 1% of X = (1/100) × X = 0.01X

=> Required subtraction = X − 0.01X

=> Result = X (1 − 0.01)

=> Result = 0.99X

=> Multiplying factor = 0.99

Therefore The correct answer is 0.99.

Additional Information

Percentage Change

To find the new value after a percentage decrease, multiply the original value by (1 − r/100).

Multiplying Factor (MF)

For a 10% increase, MF = 1.10. For a 10% decrease, MF = 0.90.

Base Change

Always assume the initial base as 100 to simplify manual calculations in percentage problems.

Q39. Answer: (c) 150 minutes

Shortcut Trick

Total Capacity (LCM of 360, 540, 720) = 2160 units.

Efficiencies: X = 6, Y = 4, Z = 3 units/min.

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Work done by Y and Z in 30 mins = (4 + 3) × 30 = 210 units.
Remaining work = 2160 − 210 = 1950 units.
Time for remaining part = 1950 ÷ (6 + 4 + 3) = 1950 ÷ 13 = 150 minutes.
Therefore The correct answer is 150 min.
Alternate Method

Pipes	Time (min)	Total Work (LCM)	Efficiency
Pipe X	360	2160 units	2160 ÷ 360 = 6
Pipe Y	540	2160 ÷ 540 = 4	
Pipe Z	720	2160 ÷ 720 = 3	

=> Total capacity of the tanker = LCM(360, 540, 720) = 2160 units.
=> Work done by Pipe Y and Pipe Z in 30 minutes = (4 + 3) × 30
=> 7 × 30 = 210 units.
=> Remaining work = Total Capacity − Work completed
=> 2160 − 210 = 1950 units.
=> Combined efficiency of X, Y, and Z = 6 + 4 + 3 = 13 units/min.
=> Time taken to fill remaining part = 1950 ÷ 13
=> Time = 150 minutes.
Therefore The correct answer is 150 min.
Additional Information
Total Work Formula
Total Work = Time Taken × Efficiency. For pipes and cisterns, efficiency of an inlet pipe is positive, and an outlet pipe is negative.
Pipes and Cisterns Concept
If pipe A fills in x hours and pipe B fills in y hours, both together fill in (x × y) ÷ (x + y) hours.
Efficiency Ratio
The efficiency of a pipe is inversely proportional to the time taken to fill the tank (E prop. to 1/T).

Q40. Answer: (c) 15.2

Shortcut Trick
Using the deviation method by taking 13 as the baseline average.
Deviations: (6.5 − 13) = −6.5, (10.6 − 13) = −2.4, (19.7 − 13) = +6.7.
Sum of known deviations = −6.5 − 2.4 + 6.7 = −2.2.
For the total average to be 13, the deviation of a must be +2.2.
Value of a = 13 + 2.2 = 15.2.
Therefore The correct answer is 15.2.
Alternate Method
Given: The observations are 6.5, 10.6, 19.7, and a. The Average of these 4 numbers is 13.
Formula Used: Average = (Sum of all observations) ÷ (Total number of observations)
=> 13 = (6.5 + 10.6 + 19.7 + a) ÷ 4
=> 13 × 4 = 36.8 + a
=> 52 = 36.8 + a
=> a = 52 − 36.8
=> a = 15.2
Therefore The correct answer is 15.2.
Additional Information
Sum of Observations
The total sum of a data set is calculated as: Sum = Average × Count. This is the primary step in missing value problems.
Average of Consecutive Numbers
For any Arithmetic Progression (AP), the average is simply: (First Term + Last Term) ÷ 2.
Net Deviation Principle
The sum of deviations of all observations from their arithmetic mean is always zero. This principle is used for faster calculations in

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large data sets.

Q41. Answer: (c) 28

Shortcut Trick

List the first 5 prime numbers: 2, 3, 5, 7, 11.

Sum = 2 + 3 + 5 + 7 + 11 = 28.

Therefore The correct answer is 28.

Alternate Method

Given: Need to find the sum of the first 5 prime numbers.

Prime Number: A natural number greater than 1 that has no positive divisors other than 1 and itself.

=> First prime number = 2

=> Second prime number = 3

=> Third prime number = 5

=> Fourth prime number = 7

=> Fifth prime number = 11

=> Total Sum = 2 + 3 + 5 + 7 + 11

=> Total Sum = 28

Therefore The correct answer is 28.

Additional Information

Definition of Prime Numbers

Numbers that have exactly two factors: 1 and the number itself. 1 is neither prime nor composite.

Even Prime Number

2 is the only even prime number; all other prime numbers are odd.

Prime Numbers up to 50

There are 15 prime numbers between 1 and 50: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47.

Q42. Answer: (a) 5.1

Shortcut Trick

Total distance to cover = Sum of lengths = 410 + 440 = 850 m.

Relative speed (same direction) = 140 − 130 = 10 km/hr.

Relative speed in m/s = 10 × (5/18) = 25/9 m/s.

Time (seconds) = 850 ÷ (25/9) = 306 seconds.

Time (minutes) = 306 ÷ 60 = 5.1 minutes.

Therefore The correct answer is 5.1 minutes.

Alternate Method

Given: Length of Train 1 (L1) = 410 m, Length of Train 2 (L2) = 440 m, Speed of Train 1 (S1) = 130 km/hr, Speed of Train 2 (S2) = 140 km/hr.

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

=> Relative Speed = S2 − S1 = 140 − 130 = 10 km/hr

=> Conversion to m/s: 10 × (5/18) = 50/18 = 25/9 m/s

=> Total Distance = L1 + L2 = 410 + 440 = 850 m

=> Time (in sec) = 850 ÷ (25/9) = (850 × 9) ÷ 25 = 34 × 9 = 306 seconds

=> Time (in min) = 306 ÷ 60 = 5.1 minutes

Therefore The correct answer is 5.1 minutes.

Additional Information

Relative Speed in Same Direction

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

Relative Speed in Opposite Direction

When two objects move in opposite directions, the relative speed is the sum of their individual speeds (S1 + S2).

Unit Conversion

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

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Q43. Answer: (a) 64

Shortcut Trick

Teacher's Age = New Average + (Original count × Increase in Average)

New Average = 38 years

Original number of students = 26

Increase in average = 38 − 37 = 1 year

Teacher's Age = 38 + (26 × 1) = 38 + 26 = 64 years

Therefore The correct answer is 64 years.

Alternate Method

Given:

Initial number of students = 26

Initial average age = 37 years

New average age (including teacher) = 38 years

Formula Used: Total Age = Average Age × Number of Persons

=> Total age of 26 students = 26 × 37 = 962 years

=> Total number of persons including teacher = 26 + 1 = 27

=> Total age of 27 persons = 27 × 38 = 1026 years

=> Teacher's Age = Total age of group − Total age of students

=> Teacher's Age = 1026 − 962 = 64 years

Therefore The correct answer is 64 years.

Additional Information

Net Deviation Concept

The sum of deviations from the average is always zero. If the new person increases the average, their value = New Average + (Previous count × Increase).

Average Property

If every value in a set is increased by a constant 'k', the average also increases by 'k'.

Weighted Average

Combined Average = (n1A1 + n2A2) ÷ (n1 + n2), where 'n' is the quantity and 'A' is the average.

Q44. Answer: (b) 504

Shortcut Trick

Ratio of Volume parts = 6 × 5 × 3 = 90 units³.

Given Volume = 720 m³ => 1 unit³ = 720 ÷ 90 = 8 => 1 unit = 2 m.

Ratio of Surface Area parts = 2 × (6×5 + 5×3 + 3×6) = 2 × (30 + 15 + 18) = 126 units².

Actual Surface Area = 126 × (1 unit)² = 126 × 2² = 126 × 4 = 504 m².

Therefore The correct answer is 504 m².

Alternate Method

Given:

Ratio of length (l), breadth (b), and height (h) = 6 : 5 : 3

Volume of the cuboid = 720 m³

Formula Used:

Volume (V) = l × b × h

Total Surface Area (TSA) = 2(lb + bh + hl)

Calculations:

Let l = 6x, b = 5x, and h = 3x.

=> Volume = 6x × 5x × 3x = 90x³

=> 90x³ = 720

=> x³ = 720 ÷ 90 = 8

=> x = √8 (cube root) = 2

=> l = 6 × 2 = 12 m, b = 5 × 2 = 10 m, h = 3 × 2 = 6 m

=> TSA = 2(12 × 10 + 10 × 6 + 6 × 12)

=> TSA = 2(120 + 60 + 72)

=> TSA = 2 × 252 = 504 m²

Therefore The correct answer is 504 m².

Additional Information

Lateral Surface Area (LSA) of Cuboid

The area of the four side faces of the cuboid is LSA = 2h(l + b).

Diagonal of a Cuboid

The longest rod that can be placed in a cuboid has length d = √(l² + b² + h²).

Properties of a Cube

For a cube with side 'a', Volume = a³ and total Surface Area = 6a².

Q45. Answer: (a) Rs. 630

Shortcut Trick

Profit Ratio = Investment Ratio (since time is equal)

Ratio of Vinod : Kajal : Arpit = 1040 : 1390 : 1890 = 104 : 139 : 189

Total Ratio Parts = 104 + 139 + 189 = 432

Arpit's share = (189 ÷ 432) × 1440 = 189 × (1440 ÷ 432) = 189 × 3.333... = 189 × (10 ÷ 3) = 63 × 10 = 630

Therefore The correct answer is Rs. 630.

Alternate Method

Given:

Investment of Vinod (C_v) = Rs. 1,040

Investment of Kajal (C_k) = Rs. 1,390

Investment of Arpit (C_a) = Rs. 1,890

Total Profit (P_(total)) = Rs. 1,440

Time period (T) = 1 year (same for all)

Calculations:

=> Ratio of Profit = Ratio of (Investment × Time)

=> P_v : P_k : P_a = (1040 × 1) : (1390 × 1) : (1890 × 1)

=> Ratio = 104 : 139 : 189

=> Sum of ratio = 104 + 139 + 189 = 432

=> Arpit's share = (189 ÷ 432) × 1440

=> Arpit's share = 189 × (1440 ÷ 432)

=> Arpit's share = 189 × 3.3333

=> Arpit's share = 189 × (10 ÷ 3) = 63 × 10

=> Arpit's share = Rs. 630

Therefore The correct answer is Rs. 630.

Additional Information

Partnership Ratio

Profit of Partner 1 : Profit of Partner 2 = (Capital1 × Time1) : (Capital2 × Time2). If time is constant, profit is proportional to capital.

Active vs Sleeping Partner

An active partner manages the business and may receive a fixed salary or extra commission before the remaining profit is divided.

Compound Partnership

When partners invest money for different time periods, it is called a compound partnership, requiring the product of capital and time for calculation.

Q46. Answer: (d) Rs. 50

Shortcut Trick

Effective Simple Interest rate for Case 1 = 5% × 3 = 15%

Effective Simple Interest rate for Case 2 = 4% × 4 = 16%

Difference in effective rates = 16% − 15% = 1%

Required difference = 1% of Principal (Rs. 5,000) = Rs. 50

Therefore The correct answer is Rs. 50.

Alternate Method

Given:
Principal (P) = Rs. 5,000
Case 1: Rate (R1) = 5%, Time (T1) = 3 years
Case 2: Rate (R2) = 4%, Time (T2) = 4 years
Formula Used:
Simple Interest (SI) = (P × R × T) ÷ 100
Calculations:
=> SI1 = (5000 × 5 × 3) ÷ 100
=> SI1 = 50 × 15 = Rs. 750
=> SI2 = (5000 × 4 × 4) ÷ 100
=> SI2 = 50 × 16 = Rs. 800
=> Difference = SI2 − SI1
=> Difference = 800 − 750 = Rs. 50
Therefore The correct answer is Rs. 50.
Additional Information
Simple Interest Formula
The basic formula is SI = (P × R × T) ÷ 100, where P is Principal, R is Rate per annum, and T is Time in years.
Total Amount
The total amount (A) at the end of the period is the sum of the Principal and the Interest: A = P + SI.
Rate and Time Relationship
For a constant Principal, the Simple Interest is directly proportional to the product of Rate and Time (R × T).

Q47. Answer: (c) 7560

Shortcut Trick
Simplify the ratio of the triangle sides: 120 : 126 : 174 → 20 : 21 : 29 (divided by 6).
Recognize (20, 21, 29) as a Pythagorean triplet because $20^2 + 21^2 = 400 + 441 = 841 = 29^2$.
The triangle is right-angled with base 120 cm and height 126 cm.
Area = 1/2 × 120 × 126 = 60 × 126 = 7560 cm^2.
Therefore The correct answer is 7560 cm^2.
Alternate Method
Given: Sides of the triangle are a = 120 cm, b = 174 cm, and c = 126 cm.
Formula Used: Heron's Formula: Area = √[s(s − a)(s − b)(s − c)], where s = (a + b + c) ÷ 2.
=> Semi-perimeter (s) = (120 + 174 + 126) ÷ 2
=> s = 420 ÷ 2 = 210 cm
=> Area = √[210 × (210 − 120) × (210 − 174) × (210 − 126)]
=> Area = √[210 × 90 × 36 × 84]
=> Area = √[18900 × 3024]
=> Area = √[57153600]
=> Area = 7560 cm^2
Therefore The correct answer is 7560 cm^2.
Additional Information
Heron's Formula
Used to find the area of any triangle when all three sides are known: Area = √[s(s−a)(s−b)(s−c)].
Pythagorean Triplets
A set of three integers satisfying $a^2 + b^2 = c^2$. Common triplets include (3,4,5), (5,12,13), (8,15,17), and (20,21,29).
Area of Right-Angled Triangle
If a triangle is right-angled, the area is simply 1/2 × product of the two sides containing the right angle.

Q48. Answer: (b) Rs. 672

Shortcut Trick
Loss of 12% means SP1 is 88% of CP.
Gain of 12% means SP2 should be 112% of CP.

Required SP = (528 ÷ 88) × 112
Required SP = 6 × 112 = 672
Therefore The correct answer is Rs. 672.
Alternate Method
Given:
Selling Price (SP1) = Rs. 528
Loss Percentage = 12%
Desired Gain Percentage = 12%
Formula Used:
Cost Price (CP) = [SP × 100] ÷ [100 − Loss%]
New Selling Price (SP2) = [CP × (100 + Gain%)] ÷ 100
Calculations:
=> CP = (528 × 100) ÷ (100 − 12)
=> CP = (528 × 100) ÷ 88
=> CP = 6 × 100 = Rs. 600
=> SP2 = [600 × (100 + 12)] ÷ 100
=> SP2 = (600 × 112) ÷ 100
=> SP2 = 6 × 112
=> SP2 = Rs. 672
Therefore The correct answer is Rs. 672.
Additional Information
Marked Price & Discount
Marked Price (MP) is the price printed on the label. Discount is always calculated on MP. SP = MP − Discount.
Successive Percentage Change
For two successive changes of a% and b%, the effective change is [a + b + (ab ÷ 100)]%.
Profit and Loss Percentage
Profit% = (Profit ÷ CP) × 100 and Loss% = (Loss ÷ CP) × 100. Both are calculated on Cost Price unless specified otherwise.

Q49. Answer: (b) 129

Shortcut Trick
List the first 10 prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29.
Group them for faster addition: (2+3+5) + (7+13) + (11+19) + (17+23) + 29
=> 10 + 20 + 30 + 40 + 29 = 129
Therefore The correct answer is 129.
Alternate Method
Given: First 10 prime numbers.
Formula Used: Sum = p1 + p2 + ... + p10
=> The first 10 prime numbers are:
2, 3, 5, 7, 11, 13, 17, 19, 23, 29
=> Sum = 2 + 3 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29
=> Sum = 5 + 5 + 7 + 11 + 13 + 17 + 19 + 23 + 29
=> Sum = 10 + 7 + 11 + 13 + 17 + 19 + 23 + 29
=> Sum = 17 + 11 + 13 + 17 + 19 + 23 + 29
=> Sum = 28 + 13 + 17 + 19 + 23 + 29
=> Sum = 41 + 17 + 19 + 23 + 29
=> Sum = 58 + 19 + 23 + 29
=> Sum = 77 + 23 + 29
=> Sum = 100 + 29
=> Sum = 129
Therefore The correct answer is 129.
Additional Information
Prime Number definition

A prime number is a natural number greater than 1 that has exactly two factors: 1 and itself. 2 is the only even prime number.
Sum of Primes up to 50
There are 15 prime numbers up to 50 (2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47), and their total sum is 328.
Composite Numbers
Numbers with more than two factors are composite numbers. Note that 1 is neither prime nor composite.

Q50. Answer: (a) 10%

Shortcut Trick
Required percentage = (Value ÷ Base Value) × 100
Required percentage = (1/20 ÷ 10/20) × 100
Required percentage = (1/10) × 100 = 10%
Therefore The correct answer is 10%.
Alternate Method
Given:
First fraction = 1/20
Second fraction (Base) = 10/20
Formula Used:
Percentage = (A / B) × 100
Calculations:
=> Required Percentage = [(1/20) / (10/20)] × 100
=> Since denominators are same, it simplifies to: (1 / 10) × 100
=> Required Percentage = 0.1 × 100
=> Required Percentage = 10%
Therefore The correct answer is 10%.
Additional Information
Percentage Change
Percentage change = [(New Value − Old Value) ÷ Old Value] × 100.
Fraction to Percentage
To convert any fraction x/y into percentage, multiply the fraction by 100.
Base Value Identification
The value following the word 'of' is usually treated as the base (denominator) in percentage calculations.

Q51. Answer: (a) Y

7 persons: A, B, C, D, W, X, Y sitting in a straight line facing North
1. No one sits to the left of D
=> D at extreme left
2. Four people sit between D and C
3. Three people sit to the right of Y
4. X sits immediately left of A
5. W is not an immediate neighbour of Y
Remaining arrangement:
Therefore Y sits third to the left of W.
Hence the correct answer is Option 1.

Q52. Answer: (d) 89

A	**÷**
B	×
C	•
D	−

Expression:
44 B 30 A 10 D 46 C 3

Replace symbols and apply BODMAS rule
44 × 30 ÷ 10 − 46 + 3
=> 44 × 30 = 1320
=> 1320 ÷ 10 = 132
=> 132 − 46 = 86
=> 86 + 3 = 89
Therefore Required value = 89.
Hence the correct answer is OPTION 4.

Q53. Answer: (d) ZBPS

Following the logic
Hence the correct answer is Option 4.

Q54. Answer: (a) 343

Series: 2, 8, 3, 27, 4, 64, 5, 125, 6, 216, 7, ?
Alternate pattern
Number and its cube
2 → 2^3 = 8
3 → 3^3 = 27
4 → 4^3 = 64
5 → 5^3 = 125
6 → 6^3 = 216
7 → 7^3 = 343
Therefore Missing number = 343.
Hence the correct answer is Option 1.

Q55. Answer: (a) Four

Given:
Series:
1 2 4 5 7 2 9 6 7 3 4 1 6 6 9 8 4 7 6 1 7 3 4 9 7
Perfect squares (single digit) = 1, 4, 9
Odd numbers = 1, 3, 5, 7, 9
Count digits where:
Previous digit = Perfect square
Next digit = Odd
Check triplets:
4 5 7 → 4 square, 7 odd Yes
9 6 7 → 9 square, 7 odd Yes
1 7 3 → 1 square, 3 odd Yes
4 9 7 → 4 square, 7 odd Yes
Total valid digits = 4
Therefore Required number of digits = 4.
Hence the correct answer is Option 1.

Q56. Answer: (c) Son's wife's father

A + B → A is the son of B
A − B → A is the brother of B
A × B → A is the wife of B
A ÷ B → A is the father of B
Relation: D ÷ F × G − H + J
Decode relation from left → right
Therefore D is the father-in-law of J's son.
Hence the correct answer is Option 3.

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Q57. Answer: (b) MKR

Series: GEL, OMT, WUB, ECJ, ?

Alphabet positions:

G = 7, E = 5, L = 12

O = 15, M = 13, T = 20

W = 23, U = 21, B = 2

E = 5, C = 3, J = 10

Each step +8 in alphabetical order

First letters:

7 → 15 → 23 → 5

=> 5 + 8 = 13 → M

Second letters:

5 → 13 → 21 → 3

=> 3 + 8 = 11 → K

Third letters:

12 → 20 → 2 → 10

=> 10 + 8 = 18 → R

Required term = MKR

Therefore The missing term is MKR.

Hence the correct answer is Option 2.

Q58. Answer: (b) lm

kit son pit → ai lm go

boss pit poem → lm jn yt

Common word → Common code

kit son pit → ai lm go

boss pit poem → lm jn yt

Common word = pit

Common code = lm

=> pit = lm

Therefore The code for pit is lm.

Hence the correct answer is Option 2.

Q59. Answer: (b) RP 29

PL 13 → SQ 16

IE 18 → LJ 21

OK 26 → ?

Therefore Required relation = RP 29.

Hence the correct answer is Option 2.

Q60. Answer: (d) 2

Boxes: A, B, C, D, E, F, G (7 boxes)

Only three boxes are kept above G.

Only one box is kept between B and G.

Only three boxes are kept between B and C.

C is kept at some place above G.

F is kept immediately below C.

E is kept at one of the places above D.

A is not kept immediately above or below B.

Final Arrangement:

Position	Box
7	A

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6	C
5	F
4	G
3	E
2	B
1	D

So, 2 boxes are kept below E.

Hence the correct answer is Option (4).

Q61. Answer: (a) J

Persons: B, C, D, I, J, K, L (7 persons)

All sitting around a circular table facing centre

Left = clockwise

Right = anticlockwise

3 persons between D and L from the right of L

3 persons between K and I from the left of K

B immediate right of D

J neighbour of L and I

Final arrangement

Find second left of C:

Left of C → I

Second left → J

Therefore J sits second to the left of C.

Q62. Answer: (c) RK-TN-WY

OH → QK → TV

LE → NH → QS

Options:

RK-TN-WZ

SK-TN-WZ

RK-TN-WY

SK-TM-WZ

1^(st) letter: +3 then +3

2^(nd) letter: +3 then +11

OH → QK

O(15) + 2 = Q(17)

H(8) + 3 = K(11)

QK → TV

Q(17) + 3 = T(20)

K(11) + 11 = V(22)

LE → NH

L(12) + 2 = N(14)

E(5) + 3 = H(8)

NH → QS

N(14) + 3 = Q(17)

H(8) + 11 = S(19)

Check option:

RK → TN

R(18) + 2 = T(20)

K(11) + 3 = N(14)

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TN → WZ
T(20) + 3 = W(23)
N(14) + 12 ≈ Z(26) (largest jump like pattern)
Therefore Correct triad = RK-TN-WZ.

Q63. Answer: (b) 4

Persons: A, B, C, D, E, F, G (7 persons)
All facing North
Only A sits to the left of D
4 persons between A and C
Only B between G and F
G not immediate neighbour of C
Remaining positions
A D G B F C E
People right of G:
B, F, C, E = 4
Therefore 4 people sit to the right of G.
Hence the correct answer is Option 2.

Q64. Answer: (a) O

Boxes: M, N, O, P, Q, R, S (7 boxes)
Only 3 boxes above S => S at position 4
1 box between R and S => R is at position 2 or 6
3 boxes between R and Q
Q is above S
If R is 2, Q must be 6 (violates Q above S)
If R is 6, Q must be 2 (satisfies Q above S) => Q at position 2
N immediately below Q => N at position 3
Remaining positions: 1, 5, 7
P is not adjacent to R (position 6), so P cannot be 5 or 7 => P at position 1
M above O => M at position 5, O at position 7
Final order (Top → Bottom):

Position	Box
7	P
6	Q
5	N
4	S
3	M
2	R
1	O

Therefore Box at the lowest position = O.
Hence the correct answer is Option 1.

Q65. Answer: (c) MQL

Hence the correct answer is Option 3.

Q66. Answer: (a) 476

Series: 501, 500, 497, 492, 485, ?
Increasing subtraction pattern
Therefore Missing number = 476.

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Hence the correct answer is Option 1.

Q67. Answer: (a) 28

A	÷
B	×
C	•
D	−

Expression:
24 A 4 B 6 C 2 D 10
Replace symbols and apply BODMAS rule
24 ÷ 4 × 6 + 2 − 10
=> 24 ÷ 4 = 6
=> 6 × 6 = 36
=> 36 + 2 = 38
=> 38 − 10 = 28
Therefore Required value = 28.
Hence the correct answer is Option 1.

Q68. Answer: (a) Two

Given:
Series:
4 1 1 7 2 4 1 2 7 4 4 9 6 3 9 1 6 1 9 2 2 8 8
Odd numbers: 1, 3, 5, 7, 9
Count numbers where:
Previous number = Odd
Current number = Odd
Next number = Odd
Check triplets:
1 1 7 → odd, odd, odd Yes
3 9 1 → odd, odd, odd Yes
Total valid numbers = 2
Therefore Required count = 2.
Hence the correct answer is Option 1.

Q69. Answer: (d) 4

TOUR → 8571
DOUT → 5478
Common letters → Common digits
Common letters in both words:
T, O, U
Common digits in both codes:
8, 5, 7
=> T, O, U correspond to 8, 5, 7 (order may vary)
Remaining letter in second word = D
Remaining digit in second code = 4
=> D = 4
Therefore Code for D = 4.
Hence the correct answer is Option 4.

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Q70. Answer: (b) 708

423 + 9 × 19 − 6 ÷ 775

Interchange operations:

• ↔ ÷

− ↔ ×

Replace operators and apply BODMAS rule

423 + 9 × 19 − 6 ÷ 775

After interchange:

423 ÷ 9 − 19 × 6 + 775

=> 423 ÷ 9 = 47

=> 19 × 6 = 114

=> 47 − 114 + 775

=> −67 + 775

=> 708

Therefore Required value = 708.

Hence the correct answer is option 2.

Q71. Answer: (d) 11 km to the south

Start at A

East = 11 km

Right turn → South = 5 km

Right turn → West = 14 km

Right turn → North = 16 km

Right turn → East = 3 km

Stop at P

=> P is 11 km North of A

To reach A from P:

=> Drive 11 km South

Therefore Shortest distance = 11 km towards South.

Q72. Answer: (d) XLO 28

Given:

Series: PDG 12, RFI 16, THK 20, VJM 24, ?

Alphabet position pattern and number pattern

Numbers pattern:

12 → 16 → 20 → 24

=> +4 each step

=> Next = 24 + 4 = 28

Letters pattern:

First letters:

P(16) → R(18) → T(20) → V(22)

=> +2 each step

=> Next = X(24)

Second letters:

D(4) → F(6) → H(8) → J(10)

=> +2 each step

=> Next = L(12)

Third letters:

G(7) → I(9) → K(11) → M(13)

=> +2 each step

=> Next = O(15)

Next term:

XLO 28
Therefore Missing cluster = XLO 28.
Hence the correct answer is Option 4.

Q73. Answer: (c) Neither conclusion (I) nor (II) follows

Given:
Statement 1: Some keyboards are mouses
Statement 2: All inverters are mouses
Check Conclusion I:
Some keyboards are inverters
=> Not definite because keyboards part of mouses may not overlap with inverters
=> Conclusion I does not follow No
Check Conclusion II:
All mouses are inverters
=> Reverse of given statement
=> Only given: All inverters are mouses
=> Conclusion II does not follow No
Therefore Neither conclusion I nor II follows.
Hence the correct answer is Option 3.

Q74. Answer: (a) QPL

Letter clusters:
QPL
AYV
BZW
DBY
Alphabet position relation
Therefore QPL is the odd letter cluster.
Hence the correct answer is option 1.

Q75. Answer: (b) 113

Series: 33, 49, 65, 81, 97, ?
Constant difference pattern
49 − 33 = 16
65 − 49 = 16
81 − 65 = 16
97 − 81 = 16
=> Pattern = +16
Next term:
97 + 16 = 113
Therefore Missing number = 113.
Hence the correct answer is Option 2.

Q76. Answer: (b) 5

Given:
Numbers: 826, 117, 681, 964, 529
Highest number = 964
Lowest number = 117
Required result = Third digit of highest number + Second digit of lowest number
Highest number = 964
=> Third digit = 4
Lowest number = 117
=> Second digit = 1

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=> 4 + 1 = 5

Therefore Resultant value = 5.

Hence the correct answer is Option 2.

Q77. Answer: (a) 5 km to the South

Distance = 5 km

Direction from P to A = South

Therefore Required shortest distance = 5 km towards South.

Hence the correct answer is Option 1.

Q78. Answer: (a) Four

Given:

Series:

4 6 5 8 2 2 1 8 2 9 8 4 7 4 8 2 4 3 1 4 1 2 7 2 6

Perfect squares (single digit) = 1, 4, 9

Count digits whose:

Previous digit = Perfect square

Next digit = Perfect square

Check triplets:

9 8 4 → 9 square, 4 square Yes

4 7 4 → 4 square, 4 square Yes

4 3 1 → 4 square, 1 square Yes

1 4 1 → 1 square, 1 square Yes

Total valid digits = 4

Therefore Required number of digits = 4.

Hence the correct answer is Option 1.

Q79. Answer: (b) Both conclusions (I) and (II) follow

Given:

Statement 1: All schools are colleges

Statement 2: No college is a radio

Check Conclusion I:

Some colleges are schools

=> If all schools are colleges, then at least some colleges must be schools

=> Conclusion I follows Yes

Check Conclusion II:

No school is a radio

=> Schools are part of colleges

=> No college is a radio

=> Therefore schools cannot be radio

=> Conclusion II follows Yes

Therefore Both conclusions I and II follow.

Hence the correct answer is Option 2.

Q80. Answer: (b) (9, 32, 23)

(26, 46, 20)

(12, 16, 4)

Third number = Second − First

Check 1st set:

46 − 26 = 20

Check 2nd set:

16 − 12 = 4

Now check options:

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(7, 23, 13)

23 − 7 = 16 ≠ 13 No

(9, 32, 23)

32 − 9 = 23 Yes

(17, 43, 23)

43 − 17 = 26 ≠ 23 No

(20, 31, 8)

31 − 20 = 11 ≠ 8 No

Therefore Correct set = (9, 32, 23).

Hence the correct answer is Option 2.

Q81. Answer: (c) Myanmar

The correct answer is Myanmar.

Key Points

• Operation Brahma was launched by India in March 2025 to provide humanitarian relief to Myanmar, which was facing a severe crisis due to political instability and natural disasters.

• The operation aimed to deliver essential supplies such as food, medicines, and shelter kits to affected populations in Myanmar.

• India, being a neighboring country, has historically extended support to Myanmar during crises, emphasizing its commitment to regional solidarity and humanitarian assistance.

• The relief operation also involved coordination with international organizations such as the United Nations and local agencies in Myanmar to ensure efficient distribution of aid.

• Operation Brahma reflected India's proactive approach in strengthening diplomatic ties and showcasing its role as a responsible regional leader in South Asia.

Additional Information

• India-Myanmar Relations:

• India and Myanmar share a 1,643 km border, making Myanmar a key neighbor in Southeast Asia.

• India has historically supported Myanmar in areas like trade, connectivity, and humanitarian aid.

• Both countries have cooperated under regional initiatives such as BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation).

• Humanitarian Operations by India:

• India has conducted several humanitarian operations in the past, such as Operation Rahat in Yemen (2015) and Operation Maitri in Nepal (2015).

• These missions involved the evacuation of stranded citizens and the provision of medical aid and supplies to disaster-affected regions.

• Myanmar's Current Challenges:

• Myanmar has faced prolonged political instability, including military coups and civil unrest.

• Natural disasters like cyclones and floods have exacerbated humanitarian needs in the country.

• India's Humanitarian Diplomacy:

• India's approach to humanitarian diplomacy is guided by the principle of "Neighborhood First."

• It emphasizes rapid response, efficient resource mobilization, and collaboration with international organizations to address crises.

Important Points

• India's Disaster Relief Expertise:

• India has developed robust capabilities in disaster relief through agencies like the National Disaster Response Force (NDRF).

• These capabilities are often utilized to assist neighboring countries during crises.

• Regional Cooperation:

• India's humanitarian aid missions often strengthen diplomatic ties and promote regional stability.

• Such operations contribute to India's image as a responsible global actor in international relations.

Q82. Answer: (a) Empower Citizens, Expose Corruption

The correct answer is Empower Citizens, Expose Corruption.

Key Points

• The new motto of the Lokpal of India, adopted by the full bench in June 2025, is "Empower Citizens, Expose Corruption."

• This motto reflects the Lokpal's commitment to strengthening public participation in governance and ensuring transparency and

accountability in the fight against corruption.

• The motto emphasizes the dual role of the Lokpal: empowering ordinary citizens by addressing their grievances and exposing corrupt practices in public offices.

• The adoption of this motto aligns with the Lokpal's broader objective under the Lokpal and Lokayuktas Act, 2013, which aims to combat corruption among public functionaries.

• By adopting this motto, the Lokpal aims to establish itself as a citizen-centric institution, encouraging whistleblowing and ensuring justice for victims of corruption.

Additional Information

• Lokpal and Lokayuktas Act, 2013:

• The Lokpal and Lokayuktas Act was enacted in 2013 to establish the Lokpal at the central level and Lokayuktas at the state level for investigating cases of corruption against public servants.

• The Lokpal consists of a chairperson and up to eight members, half of whom must be judicial members and at least 50% from SC/ST/OBC, minorities, or women.

• The jurisdiction of the Lokpal covers the Prime Minister (with specific safeguards), ministers, Members of Parliament, and group A, B, C, and D officers and officials of the central government.

• Role of the Lokpal:

• The Lokpal is mandated to ensure effective action against corruption in public offices, thereby fostering good governance.

• The institution works towards strengthening accountability mechanisms and addressing citizens' grievances related to corruption.

• Features of the Motto:

• "Empower Citizens": This part of the motto focuses on enabling citizens to actively participate in governance and hold public officials accountable.

• "Expose Corruption": This emphasizes the Lokpal's role in uncovering and addressing corrupt practices, ensuring transparency and fairness in administrative processes.

• Other Anti-Corruption Mechanisms in India:

• Central Vigilance Commission (CVC): Established to address corruption in central government organizations.

• Central Bureau of Investigation (CBI): Investigates high-profile corruption cases and economic offenses.

• Whistleblowers Protection Act, 2014: Provides a mechanism to protect individuals who expose corruption or misuse of power by public servants.

Q83. Answer: (d) Netherlands

The correct answer is Netherlands.

Key Points

• The 2025 NATO Summit is scheduled to be hosted by the Netherlands, marking an important event for NATO member nations to discuss global security, defense strategies, and future collaborations.

• The selection of the Netherlands as the host country reflects its strategic importance and active role in NATO operations and policymaking.

• The summit will bring together leaders of the 31 member states to address pressing global issues such as cybersecurity threats, military alliances, and geopolitical tensions.

• The Netherlands has previously hosted NATO-related meetings, showcasing its strong commitment to collective defense and international cooperation.

• This summit is expected to focus on strengthening NATO's policies regarding the Indo-Pacific region, defense modernization, and the incorporation of advanced technologies in military operations.

Additional Information

• About NATO:

• The North Atlantic Treaty Organization (NATO), established in 1949, is a political and military alliance of countries from Europe and North America.

• NATO's primary purpose is to ensure the security and defense of its member nations through collective military support and strategic partnerships.

• The organization operates under the principle of Article 5, which states that an attack against one member is considered an attack against all members.

• Current membership includes 31 countries, with Finland being the most recent member, joining in April 2023.

• The Netherlands and NATO:

• The Netherlands is one of NATO's founding members and has consistently contributed to its operations and missions.

• It plays a key role in initiatives such as the Enhanced Forward Presence in Eastern Europe and NATO's air policing missions.

• The country hosts several NATO facilities and collaborates on defense technology, including cybersecurity and military

innovation.

• The Netherlands' defense expenditure has been increasing to meet NATO's guideline of spending 2% of GDP on defense.

• Importance of NATO Summits:

• NATO summits serve as a platform for member nations to address global security challenges, strengthen military alliances, and plan future strategies.

• These meetings often result in declarations and agreements concerning defense spending, technological advancements, and expansion of partnerships.

• Recent summits have emphasized issues like climate change, cybersecurity, and the geopolitical implications of rising powers like China.

• Other Host Countries:

• Germany: While Germany is a significant NATO member, it did not host the 2025 summit.

• Turkey: Turkey has hosted NATO summits before but is not the host for the 2025 meeting.

• Brazil: Brazil is not a NATO member and hence cannot host a NATO summit.

Important Points

• Article 5: This core principle of NATO ensures collective defense among member nations, making the alliance a cornerstone of global security.

• Cybersecurity: NATO has been prioritizing cybersecurity, with initiatives to counter cyber threats and ensure the digital resilience of member states.

• Defense Spending: Member nations are encouraged to allocate 2% of their GDP toward defense expenditures to strengthen collective military capabilities.

• Geopolitical Focus: Recent NATO policies have addressed the rise of new powers like China and security concerns in the Indo-Pacific region.

Q84. Answer: (b) Providing detailed weather forecasts

The correct answer is Providing detailed weather forecasts.

Key Points

• Bharat Forecasting System was launched in May 2025 to provide high-resolution weather forecasts across India.

• The system leverages advanced meteorological models to deliver accurate and detailed weather predictions, including temperature, rainfall, wind speed, and humidity levels.

• It is designed to improve disaster preparedness by providing early warnings for extreme weather events such as cyclones, floods, and droughts.

• Developed by India Meteorological Department (IMD) in collaboration with leading research institutions and international organizations.

• The system integrates satellite data, ground observations, and AI-driven analytics to enhance the accuracy of predictions.

Additional Information

• India Meteorological Department (IMD):

• The IMD is the principal agency responsible for weather forecasting, climate monitoring, and seismology in India.

• It operates under the Ministry of Earth Sciences and was established in 1875.

• IMD uses state-of-the-art technologies such as Doppler radar systems, satellite imaging, and numerical weather prediction models for forecasting.

• Applications of Weather Forecasting:

• Weather forecasts are crucial for agriculture, as they help farmers plan sowing, irrigation, and harvesting activities.

• They support aviation and maritime industries by ensuring safe navigation and operations.

• Forecasts contribute to disaster management by providing timely warnings of extreme weather events like cyclones and floods.

• Global Weather Forecasting Systems:

• Countries like the USA and Japan use advanced systems such as NOAA's Global Forecast System and Japan's JMA Weather Forecasting Model.

• India's Bharat Forecasting System is a significant step forward in aligning with global standards for weather prediction.

• Technologies Used in the Bharat Forecasting System:

• Integration of satellite data from ISRO's earth observation satellites like INSAT and RISAT.

• Use of AI and machine learning algorithms to improve forecast accuracy.

• Ground-based monitoring networks including automatic weather stations and rain gauges.

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Q85. Answer: (b) Rs. 25,000

The correct answer is Rs. 25,000.

Key Points

• The Sports Ministry of India approved a monthly out-of-pocket allowance of Rs. 25,000 for hockey players attending the national camp in 2025. This initiative emphasizes the importance of supporting the athletes financially.

• This decision was aimed at ensuring that players can meet their personal expenses while focusing entirely on their training and preparations for national and international events.

• The allowance is part of the government's ongoing efforts to promote sports excellence and provide adequate support to athletes representing the country.

• Hockey, as India's national sport, has received increasing attention in recent years, with the government focusing on providing better infrastructure, training facilities, and financial support to players.

• The initiative underscores the commitment of the Indian government to nurture talent and improve the performance of Indian hockey teams on the global stage.

Additional Information

• Hockey in India:

• Hockey is considered the national sport of India and has a rich history, with India winning multiple gold medals at the Olympics, especially during the mid-20th century.

• In recent years, Indian hockey has seen a resurgence with the men's team winning a bronze medal at the Tokyo Olympics 2021 and the women's team reaching the semi-finals.

• Hockey India is the governing body for the sport in India and works closely with the Sports Ministry and international federations.

• Government Initiatives for Sports:

• The government has launched several initiatives, such as Khelo India and Target Olympic Podium Scheme (TOPS), to support athletes in various sports, including hockey.

• Khelo India focuses on grassroots development and identifying young talent, while TOPS provides financial and infrastructural support to elite athletes.

• Significance of Financial Support:

• Providing financial allowances ensures that athletes can focus on their training without worrying about personal expenses, such as food, transportation, or medical needs.

• It also acts as a morale booster and recognizes the efforts of players representing the country at the highest levels.

• Other Sports Supported:

• While hockey is a priority, similar financial support is extended to athletes in other sports under various government schemes.

• This holistic approach aims to improve India's overall performance in global sporting events such as the Olympics, Asian Games, and Commonwealth Games.

Important Points

• Support for National Camps:

• National camps are organized to provide athletes with world-class coaching, facilities, and exposure to prepare for international tournaments.

• The camps include rigorous training sessions, fitness assessments, and strategy discussions to ensure peak performance.

• Impact of Financial Allowances:

• The Rs. 25,000 monthly allowance ensures that players can maintain a healthy lifestyle, which is crucial for their physical and mental well-being.

• It also allows players to invest in additional resources, such as nutritionists or physiotherapists, for enhanced performance.

• Future of Indian Hockey:

• With increased support and improved infrastructure, Indian hockey is poised to regain its dominance on the global stage.

• Continued government initiatives and private sponsorships are crucial for sustained success.

Q86. Answer: (d) Department of Economic Affairs

The correct answer is Department of Economic Affairs.

Key Points

• The Department of Economic Affairs is a part of the Ministry of Finance, Government of India, and is primarily responsible for the preparation and release of the Economic Survey of India, including the 2025 edition.

• The Economic Survey provides a detailed analysis of the country’s economic progress, challenges, and outlook for the coming financial year, serving as a precursor to the Union Budget.

• The Survey is typically released a day before the presentation of the Union Budget in Parliament. It is a crucial document for policymakers, economists, and researchers.

• The Department of Economic Affairs works closely with the Chief Economic Advisor (CEA) to compile and prepare this document. The CEA plays a pivotal role in shaping its content and focus.

• The Survey addresses various aspects, such as economic growth rates, fiscal policy, monetary policy, inflation trends, external sector performance, and employment statistics.

Additional Information

• Economic Survey of India:

• The Economic Survey is an annual document that reviews the performance of the Indian economy over the past year and presents policy recommendations for the upcoming year.

• The first Economic Survey of India was published in 1950-51 and was initially included in the Union Budget documents. It became a standalone document from 1964.

• It is regarded as the government's flagship economic report and is prepared under the guidance of the Chief Economic Advisor (CEA).

• The Survey is divided into two volumes: Volume I focuses on conceptual and analytical issues, while Volume II provides detailed statistical data and sectoral analysis.

• Department of Economic Affairs (DEA):

• The DEA is one of the five departments under the Ministry of Finance. It is responsible for handling the economic policy framework and financial regulations in India.

• Its functions include managing the country's external debt, currency exchange policies, and financial market regulations.

• The department oversees the preparation of crucial financial documents, such as the Union Budget, Economic Survey, and various fiscal reports.

• It also collaborates with international organizations like the IMF, World Bank, and Asian Development Bank on financial and economic matters.

• Chief Economic Advisor (CEA):

• The CEA is the principal advisor to the government on economic matters and plays a vital role in preparing the Economic Survey.

• The position is typically held by an eminent economist with expertise in macroeconomic policy and research.

• The CEA provides inputs on issues such as GDP growth, inflation, fiscal deficit, and structural reforms.

• The tenure of the CEA is generally for three years, and the individual reports directly to the Finance Minister.

• Union Budget vs. Economic Survey:

• The Union Budget is a financial statement that outlines the government's revenue and expenditure for the upcoming fiscal year. It is presented in February each year.

• The Economic Survey, on the other hand, is a review of the economy's performance in the past year and includes policy suggestions to address current challenges.

• While the Budget is focused on fiscal planning, the Survey emphasizes broader economic trends and strategic recommendations.

• Both documents are critical for understanding the economic priorities and direction of the government.

Important Points

• The Economic Survey acts as a tool for initiating public discussions on economic policy and reform measures.

• It provides insights into topics like climate change, digital economy, healthcare, education, and employment.

• Recent editions have highlighted the importance of Aatmanirbhar Bharat, green energy transition, and post-pandemic recovery.

• India's GDP growth rate projections and fiscal deficit targets are key features of the Survey that garner widespread attention.

• The Survey also includes innovative chapters, such as those on behavioral economics and data-driven governance, to address emerging challenges.

Q87. Answer: (a) Green Hydrogen Certification Scheme of India

The correct answer is Green Hydrogen Certification Scheme of India.

Key Points

• Green Hydrogen Certification Scheme of India (GHCI) was launched by Union Minister of New and Renewable Energy, Pralhad Joshi, on 29 April 2025.

• The aim of the scheme is to empower MSMEs (Micro, Small, and Medium Enterprises) and promote the green hydrogen economy, a crucial step toward achieving sustainability goals.

• The scheme focuses on the certification of green hydrogen production to ensure that it is produced using renewable energy sources, adhering to global standards for carbon neutrality.

• The GHCI will provide a framework for monitoring, verifying, and certifying green hydrogen, enabling India to establish itself as a reliable supplier of green hydrogen in the global market.

• This initiative aligns with India’s commitment to achieving net-zero emissions by 2070 and its National Hydrogen Energy Mission, announced in 2021.

Additional Information

• Green Hydrogen:

• Green hydrogen is produced through the process of electrolysis of water using renewable energy sources such as solar, wind, or hydropower.

• It is considered a clean energy source as it produces no carbon emissions, making it crucial for decarbonizing industries like steel, cement, and transportation.

• Global demand for green hydrogen is expected to increase exponentially as countries aim to meet their climate targets under the Paris Agreement.

• Role of MSMEs in the Green Hydrogen Economy:

• MSMEs play a significant role in manufacturing and innovation within the green hydrogen supply chain.

• The GHCI scheme is expected to provide these enterprises with financial incentives, technical support, and market access to adopt green hydrogen technologies.

• National Hydrogen Energy Mission:

• Launched in 2021, this mission focuses on the production and export of green hydrogen to position India as a global leader in clean energy.

• The mission seeks to reduce India’s dependence on fossil fuels and achieve energy self-reliance.

• Global Context:

• Countries like Germany, Japan, and Australia are investing heavily in green hydrogen as a part of their energy transition strategies.

• The certification process under GHCI will align India’s green hydrogen production with international standards, enhancing its export potential.

Important Points

• Significance of Green Hydrogen:

• Green hydrogen is expected to replace fossil fuels in energy-intensive sectors and contribute to reducing global greenhouse gas emissions.

• It is also a key component of India's strategy to become a global leader in renewable energy.

• Challenges in Adopting Green Hydrogen:

• The production of green hydrogen is currently cost-intensive due to the high costs of renewable energy and electrolyzers.

• GHCI aims to address these challenges by fostering innovation and scaling up production technologies to reduce costs.

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Q88. Answer: (b) Rajnath Singh

The correct answer is Rajnath Singh.

Key Points

• Rajnath Singh, the Defence Minister of India, announced the development plans for the Advanced Medium Combat Aircraft (AMCA) during the CII Business Summit in May 2025.

• The AMCA is an ambitious indigenous program aimed at developing a 5th-generation stealth fighter aircraft for the Indian Air Force (IAF).

• This project is being developed by Hindustan Aeronautics Limited (HAL) in collaboration with the Defence Research and Development Organisation (DRDO).

• The AMCA program will include state-of-the-art features like stealth technology, supercruise capability, advanced avionics, and AI-based systems.

• The announcement reflects the Indian government’s focus on Atmanirbhar Bharat (Self-Reliant India) by encouraging indigenous defence manufacturing and reducing dependency on foreign technology.

Additional Information

• Advanced Medium Combat Aircraft (AMCA):

• The AMCA is a multi-role aircraft designed to perform missions like air superiority, ground attack, electronic warfare, and reconnaissance.

• It is expected to feature twin engines, internal weapons bays, and a stealthy design with reduced radar cross-section.

• The aircraft will incorporate AI-driven avionics, smart sensors, and advanced cockpit systems for modern warfare.

• The prototype is expected to be ready by 2027, with production planned for the early 2030s.

• The AMCA is a critical part of India’s efforts to develop a next-generation fighter aircraft to replace older jets like the Mirage 2000 and MiG-29.

• Rajnath Singh:

• Rajnath Singh is the current Defence Minister of India, holding office since May 2019.

• He has played a pivotal role in promoting indigenous defence manufacturing and spearheading initiatives like Defence Corridors in Uttar Pradesh and Tamil Nadu.

• Under his leadership, India has seen increased investments in defence technology and partnerships with domestic and international firms.

• Indigenous Defence Manufacturing:

• The Indian government has launched several initiatives to boost domestic defence production, including the Make in India and Atmanirbhar Bharat campaigns.

• Projects like the Tejas Light Combat Aircraft (LCA), INS Vikrant (India's first indigenous aircraft carrier), and the AMCA are part of this broader effort.

• The goal is to make India a global hub for defence manufacturing and reduce reliance on imports.

• 5th-Generation Fighter Aircraft:

• 5th-generation fighter aircraft are characterized by stealth, advanced avionics, integrated sensors, and supercruise capability.

• Examples include the F-22 Raptor and F-35 Lightning II of the United States.

• India aims to join the elite group of nations with such aircraft by developing the AMCA.

Important Points

• Stealth Features: The AMCA will include stealth technologies like radar-absorbing materials (RAM) and a reduced infrared signature to enhance survivability.

• Supercruise Capability: It will be capable of maintaining supersonic speeds without afterburners, improving fuel efficiency and reducing detectability.

• Collaborations: India is exploring partnerships with global firms for critical technologies while ensuring the majority of components are produced domestically.

• Strategic Importance: The AMCA will strengthen India's air combat capabilities, ensuring readiness for future conflicts and geopolitical challenges.

Q89. Answer: (b) Securities and Exchange Board of India (SEBI)

The correct answer is Securities and Exchange Board of India (SEBI).

Key Points

• Securities and Exchange Board of India (SEBI) announced the introduction of 'Validated UPI Handles' in June 2025, effective from 1 October 2025, aiming to ensure secured payments by investors.

• The initiative is designed to enhance investor protection and combat fraudulent practices, marking a significant step toward improving transaction security in the financial markets.

• SEBI is the regulatory authority for the securities and capital markets in India, established under the Securities and Exchange Board of India Act, 1992.

• The 'Validated UPI Handles' mechanism facilitates two-factor authentication, ensuring that payments are routed securely between investors and intermediaries.

• This move aligns with SEBI's broader efforts to promote transparency and safeguard the interests of retail investors in the Indian financial ecosystem.

Additional Information

• Securities and Exchange Board of India (SEBI):

• SEBI was established in 1992 to regulate the securities market in India and protect investors' interests.

• Its headquarters are located in Mumbai, Maharashtra.

• SEBI's primary functions include regulating stock exchanges, mutual funds, and brokers, and ensuring the orderly development of the securities market.

• It is empowered to investigate and take actions against fraudulent activities under the Securities Contract Regulation Act, 1956 and the SEBI Act, 1992.

• Unified Payments Interface (UPI):

• UPI is a real-time payment system developed by the National Payments Corporation of India (NPCI) in 2016.

• It allows instant money transfers between bank accounts using mobile devices, simplifying transactions for individuals and businesses.

• UPI has gained immense popularity due to its ease of use, low transaction costs, and robust security features.

• SEBI's initiative to validate UPI handles ensures that they are securely linked to investors' accounts to prevent fraudulent transactions.

• Investor Protection Measures by SEBI:

• SEBI has introduced multiple frameworks to safeguard retail investors, including disclosures by mutual funds, strengthened KYC norms, and risk management systems.
• It mandates brokers and intermediaries to implement secure payment mechanisms to protect investors' funds.
• Investor education programs are regularly conducted to spread awareness regarding safe investment practices.
• Fraud Mitigation in Financial Transactions:
• Fraudulent activities in the financial markets often stem from unauthorized access to payment gateways or investor accounts.
• SEBI's validation of UPI handles ensures that only legitimate and authenticated transactions occur, reducing the risk of fraud.
• Such mechanisms are essential for building investor confidence and fostering sustainable growth in the Indian securities market.

Important Points

• Life Insurance Corporation (LIC):
• LIC is a government-owned insurance corporation established in 1956 under the LIC Act.
• It primarily provides life insurance policies and investment opportunities for individuals.
• While LIC plays a significant role in India's financial sector, it does not regulate securities or UPI transactions.
• Reserve Bank of India (RBI):
• RBI is India's central banking institution responsible for monetary policy, currency issuance, and financial stability.
• Although RBI oversees payment systems like UPI, SEBI governs securities market transactions, making it the authority behind this announcement.
• State Bank of India (SBI):
• SBI is India's largest public sector bank, providing banking and financial services to individuals and businesses.
• While SBI facilitates UPI transactions, it does not have regulatory powers over securities markets.

Q90. Answer: (d) Valueattics Reinsurance

The correct answer is Valueattics Reinsurance.

Key Points

• Valueattics Reinsurance became the first private-sector reinsurer to be licensed under the new framework of the Insurance Regulatory and Development Authority of India (IRDAI) in March 2025.
• The IRDAI introduced the new framework to encourage private participation in the reinsurance sector, thereby enhancing competition and efficiency in the Indian insurance market.
• Reinsurance involves the transfer of portions of risk portfolios from primary insurers to reinsurers, ensuring stability and reducing the financial burden on insurance companies.
• The licensing of private reinsurers like Valueattics Reinsurance aligns with the government's objective to attract global investments and expertise into India's insurance sector.
• This initiative also aims to strengthen the domestic insurance market, making it more robust and capable of handling large-scale risks.

Additional Information

• Reinsurance:
• Reinsurance is a financial arrangement where an insurance company transfers part of its risk to another company (reinsurer) to mitigate potential losses.
• It allows insurers to underwrite policies with higher limits while maintaining financial stability.
• Reinsurance can be categorized into two types: Proportional Reinsurance and Non-Proportional Reinsurance.
• Examples of global reinsurers include Munich Re, Swiss Re, and Hannover Re.
• Insurance Regulatory and Development Authority of India (IRDAI):
• Established in 2000, IRDAI is the apex regulatory authority for the insurance and reinsurance sectors in India.
• It ensures the orderly growth of the insurance industry and protects policyholders' interests.
• IRDAI is headquartered in Hyderabad, Telangana.
• It also promotes innovation in insurance products and fosters fair competition among insurers.
• Private Participation in Reinsurance:
• The Indian government has opened up the reinsurance market to private and foreign companies to increase competition and efficiency.
• This move allows Indian insurers to access global expertise and innovative risk management solutions.
• It also facilitates better pricing of insurance products and improved claims settlement processes.
• Significance of Licensing Private Reinsurers:
• Private reinsurers bring additional capital to the insurance market, supporting its growth.

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• They provide specialized risk management solutions tailored to specific needs.

• This development fosters a competitive environment, benefiting policyholders with better products and services.

Important Points

• Global Reinsurance Market:

• Reinsurance is a key component of the global financial system, with major markets in Europe, North America, and Asia.

• India's growing insurance market presents an opportunity for global reinsurers to expand their footprint.

• IRDAI's Role in Promoting Reinsurance:

• IRDAI has implemented policies to ease entry barriers for private and foreign reinsurers.

• It ensures a level playing field by regulating the operations of reinsurers in India.

Q91. Answer: (a) Narendra Modi

The correct answer is Narendra Modi.

Key Points

• Narendra Modi, the Prime Minister of India, joined Truth Social, a social media platform owned by former US President Donald Trump, in March 2025.

• Truth Social is a social media platform launched by Trump Media & Technology Group (TMTG) with the aim to provide an alternative space for free speech and conservative voices.

• Modi's decision to join the platform was seen as a step to enhance diplomatic relations between India and the United States, and to connect with a wider global audience.

• Truth Social has gained popularity among political leaders and figures globally for its promise of unrestricted expression and resistance to censorship prevalent on mainstream social media platforms.

• This move is part of Modi's strategy to leverage digital platforms for global outreach and communication, aligning with his leadership's emphasis on technology-driven diplomacy.

Additional Information

• Narendra Modi:

• Born on 17 September 1950, Narendra Modi is the 14th Prime Minister of India, serving since May 2014.

• Known for his strong emphasis on digital transformation, he has launched initiatives such as Digital India to connect India digitally.

• Modi has a significant presence on social media platforms such as Twitter, Facebook, and Instagram, showcasing his global outreach strategy.

• His leadership style is characterized by a focus on economic reforms, international diplomacy, and leveraging technology for governance.

• Truth Social:

• Launched in February 2022, Truth Social is a social media platform developed by Trump Media & Technology Group (TMTG).

• The platform aims to promote free speech and provide a space for conservative voices that often face censorship on other platforms.

• It has attracted several political figures and influencers globally, particularly from right-wing or conservative ideologies.

• Truth Social operates as an alternative to mainstream platforms like Twitter and Facebook.

• Global Digital Diplomacy:

• Many global leaders, including Narendra Modi, use digital platforms for diplomacy and outreach, helping them connect with citizens and international audiences.

• Digital diplomacy includes the use of social media channels to address global issues, foster international relations, and promote national interests.

• Platforms like Twitter and Truth Social have become critical tools for leaders to communicate directly with people worldwide.

• Donald Trump:

• Donald Trump served as the 45th President of the United States from 2017 to 2021.

• He launched Truth Social as a part of his media and technology group to counter censorship and promote free speech.

• Trump has been a prominent user of social media, often using platforms to directly communicate with the public.

• His initiatives like Truth Social aim to create platforms that align with his political and ideological goals.

Important Points

• Political Leaders on Social Media:

• Social media platforms have become vital tools for political leaders to engage with their constituencies and global audiences.

• Platforms like Truth Social and Twitter allow leaders to share their viewpoints, policies, and achievements directly.

• Such platforms also play a significant role in shaping public opinion and fostering international communication.

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• Leaders joining new platforms often signify shifts in diplomatic or political strategies to reach specific audiences.

• Digital Outreach in Politics:

• Digital outreach is increasingly critical in politics, enabling direct interaction between leaders and citizens.

• It helps leaders bypass traditional media channels and communicate their messages unfiltered.

• Such initiatives are vital for building transparency and fostering public trust.

Q92. Answer: (a) Alexander Zverev

The correct answer is Alexander Zverev.

Key Points

• Jannik Sinner, an Italian professional tennis player, defeated Alexander Zverev in the final of the Australian Open 2025 to claim his maiden Grand Slam title.

• The Australian Open 2025 was held at the Rod Laver Arena in Melbourne, Australia, which is known as one of the four Grand Slam tournaments in tennis.

• Alexander Zverev, a German tennis player, entered the final as a strong contender due to his consistent performance in the tournament. However, Sinner showcased exceptional skill and determination to secure the victory.

• The final match was marked by Sinner's aggressive baseline play, precise shot-making, and composure under pressure, which allowed him to outperform Zverev in crucial moments.

• This victory was a significant milestone in Sinner's career, as it elevated him into the elite group of Grand Slam champions and solidified his position as one of the top players in the tennis world.

Additional Information

• Jannik Sinner:

• Sinner is an Italian tennis player born on August 16, 2001, in San Candido, Italy.

• He is known for his powerful groundstrokes, exceptional agility, and mental toughness on the court.

• Before the 2025 Australian Open, Sinner had reached several ATP finals and was considered one of the most promising young talents in tennis.

• His victory in the 2025 Australian Open marked his first Grand Slam title, making him the first Italian male player to win the tournament.

• Alexander Zverev:

• Zverev is a German tennis player born on April 20, 1997, in Hamburg, Germany.

• He has been a consistent performer on the ATP Tour, with multiple ATP titles to his name, including Masters 1000 events.

• Zverev reached the final of the 2025 Australian Open after defeating several top-seeded players, showcasing his powerful serve and strong baseline game.

• Despite his loss in the final, Zverev's performance in the tournament demonstrated his status as one of the leading players in men's tennis.

• Australian Open:

• The Australian Open is one of the four Grand Slam tournaments, held annually in January in Melbourne, Australia.

• It is played on a hard court surface and is known for its intense competition and high attendance.

• The tournament features singles, doubles, and mixed doubles events, attracting the best tennis players from around the globe.

• Winners of the Australian Open earn substantial prize money and ranking points, making it a highly prestigious event in the tennis calendar.

• Grand Slam Tournaments:

• The four Grand Slam tournaments in tennis are the Australian Open, French Open, Wimbledon, and US Open.

• These tournaments represent the highest level of achievement in the sport and are held annually in different locations.

• Winning a Grand Slam title is considered the pinnacle of a tennis player's career.

• Each tournament has its unique characteristics, such as surface type and historical significance.

Important Points

• Sinner's Historical Achievement: Jannik Sinner became the first Italian male player to win the Australian Open, making history for his country in tennis.

• Surface of Play: The Australian Open is played on a hard court, which favors players with strong baseline games and quick movement.

• Significance of the 2025 Final: The 2025 Australian Open final was a clash between two highly skilled players, representing the next generation of tennis stars.

• Prize Money and Ranking Points: Winning the Australian Open provides significant financial rewards and boosts a player's ATP ranking, enhancing their career prospects.

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Q93. Answer: (d) Second

The correct answer is Second.

Key Points

• Neeraj Chopra, India's celebrated javelin thrower, competed in the 2025 Doha Diamond League javelin event and secured the second position.

• The Doha Diamond League is part of the prestigious Diamond League series, organized annually by World Athletics, bringing together elite athletes from around the globe.

• Neeraj Chopra's performance in the event highlighted his consistent ability to compete against the world's best, maintaining his stronghold as one of the premier javelin throwers globally.

• His throw at the event fell just short of the winning mark, but his result reinforced his status as a top contender in the lead-up to other major events, such as the World Championships and the Olympics.

• The 2025 Doha Diamond League saw fierce competition, with top javelin throwers such as Johannes Vetter and Anderson Peters also participating, making Chopra's silver medal even more commendable.

Additional Information

• Neeraj Chopra's Achievements:

• Neeraj Chopra won the gold medal in the 2020 Tokyo Olympics, becoming the first Indian to win an Olympic medal in athletics.

• He has also won medals in major events such as the World Athletics Championships, Asian Games, and Commonwealth Games.

• He holds the Indian national record for the javelin throw with a distance of 89.94 meters, achieved in 2022.

• Doha Diamond League:

• The Doha Diamond League is one of the annual events in the Diamond League series, which serves as a platform for world-class athletes to compete in track and field events.

• Held in Doha, Qatar, this event is known for its state-of-the-art facilities and attracts some of the biggest names in athletics.

• The 2025 edition featured intense competition in various disciplines, including the javelin throw.

• Javelin Throw:

• The javelin throw is a track and field event where athletes throw a spear-like implement as far as possible.

• The men's javelin must weigh 800 grams and be 2.6 to 2.7 meters long, as per World Athletics regulations.

• Key factors influencing performance include technique, strength, and optimal release angle (around 35-40 degrees).

• Competitors:

• Johannes Vetter: A German javelin thrower and one of the leading athletes in the discipline, with a personal best of 97.76 meters.

• Anderson Peters: A Grenadian thrower and two-time World Champion known for his consistency in major competitions.

Important Points

• India's Progress in Athletics:

• India's recent success in athletics, led by athletes like Neeraj Chopra, has inspired a surge in interest in track and field events within the country.

• Efforts by the Athletics Federation of India (AFI) and government initiatives, such as Khelo India, have played a significant role in identifying and nurturing talent.

• Neeraj Chopra's achievements have positioned India as a growing force in the world of athletics, paving the way for future generations of athletes.

Q94. Answer: (d) Nepal

The correct answer is Nepal.

Key Points

• The Yala Glacier, located in the Langtang region of Nepal, was officially declared "dead" in 2025 due to the severe impact of climate change.

• A glacier is considered "dead" when it no longer exhibits any signs of movement or replenishment from snowfall, effectively ceasing to function as a glacier.

• The declaration of the Yala Glacier's demise highlights the accelerated melting of glaciers in the Himalayan region, which is attributed to rising global temperatures caused by greenhouse gas emissions.

• The Yala Glacier has been a critical source of freshwater for local communities and ecosystems, and its disappearance threatens water security in the region.

• This event underscores the urgent need for international efforts to combat climate change, particularly in vulnerable regions like the Himalayas.

Additional Information

• Yala Glacier:

• The Yala Glacier is located in the Langtang National Park, approximately 28 kilometers north of Kathmandu, Nepal.

• It is situated at an altitude of around 5,000 meters and has been a key site for glaciological studies for decades.

• The glacier has been retreating rapidly over the past few decades due to global warming and changes in precipitation patterns.

• Impact of Glacier Melting in the Himalayas:

• The Himalayan glaciers are often referred to as the "Third Pole" due to their vast ice reserves, which are crucial for water supply in Asia.

• Glacier melting leads to the loss of freshwater resources, affecting millions of people dependent on rivers originating from these glaciers, such as the Ganges, Brahmaputra, and Indus.

• It also increases the risk of glacial lake outburst floods (GLOFs), which can cause catastrophic damage to downstream areas.

• Causes of Glacier Retreat:

• Global Warming: Rising global temperatures due to greenhouse gas emissions are the primary cause of glacier retreat worldwide.

• Black Carbon: Deposition of soot and black carbon on glacier surfaces accelerates melting by reducing the glacier's albedo (reflectivity).

• Changes in Precipitation: Altered monsoon patterns and reduced snowfall contribute to the shrinkage of glaciers in the Himalayas.

• Global Efforts to Combat Climate Change:

• The Paris Agreement, adopted in 2015, aims to limit global warming to below 2°C compared to pre-industrial levels, with efforts to limit it to 1.5°C.

• Organizations like the International Centre for Integrated Mountain Development (ICIMOD) are working to address the impacts of climate change in the Himalayan region.

Important Points

• Other Himalayan Glaciers at Risk:

• The Gangotri Glacier in India, which feeds the Ganges River, has also been retreating rapidly over the years.

• The Imja Glacier in Nepal has formed a glacial lake, increasing the risk of GLOFs.

• Role of Local Communities:

• Local communities in the Himalayas are adopting sustainable practices to mitigate the impacts of glacier retreat.

• Efforts include water conservation, afforestation, and promoting awareness about climate change.

• Scientific Research:

• Continuous monitoring of glaciers using satellite imagery and field studies is crucial for understanding the pace of glacial retreat.

• Research institutions worldwide are collaborating to study the impacts of climate change on the Himalayas.

Q95. Answer: (c) Bihar Rajya Jeevika Nidhi Saakh Sahkari Sangh Limited

The correct answer is Bihar Rajya Jeevika Nidhi Saakh Sahkari Sangh Limited.

Key Points

• Prime Minister Narendra Modi launched a cooperative society in Bihar named Bihar Rajya Jeevika Nidhi Saakh Sahkari Sangh Limited in September 2025.

• The primary aim of this initiative is to provide easy access to funds at affordable interest rates to the members of the community in Bihar.

• This cooperative society is designed to empower rural communities by offering financial support, particularly to economically weaker sections.

• The cooperative society aligns with the government’s vision of enhancing rural financial inclusion and strengthening the cooperative sector in India.

• The society will play a crucial role in supporting livelihood activities and promoting self-reliance among rural populations in Bihar.

Additional Information

• Bihar Rajya Jeevika Nidhi Saakh Sahkari Sangh Limited:

• This cooperative society has been established under the cooperative framework of India to address the financial needs of rural communities.

• Its focus is on providing microloans and credit facilities to small-scale farmers, artisans, and women-led self-help groups.

• It aims to foster the spirit of collective growth and cooperation in rural Bihar.

• The initiative is expected to complement other government programs like PM-KISAN and Jeevika schemes, which aim to boost rural development.

• Cooperative Societies in India:

• Cooperative societies are autonomous associations of people united voluntarily to meet common economic, social, and cultural needs through a jointly-owned enterprise.

• They play a significant role in agriculture, rural finance, and self-help groups.

• These societies are governed by the Co-operative Societies Act, 1912 and respective state laws.

• Key Government Initiatives for Rural Development:

• PM-KISAN: Provides income support of Rs. 6,000 annually to small and marginal farmers.

• Jeevika Project: A livelihood project in Bihar that aims to enhance the income of rural households through self-help groups.

• Rural Infrastructure Development Fund (RIDF): Focuses on building infrastructure like roads, irrigation facilities, and rural markets.

• Financial Inclusion and Rural Development:

• Financial inclusion refers to making financial products and services accessible and affordable to all individuals and businesses, especially the vulnerable sections of society.

• Programs like PMJDY (Pradhan Mantri Jan Dhan Yojana) and Microfinance initiatives aim to provide banking facilities to the unbanked population in rural areas.

• Such initiatives support economic growth, reduce poverty, and promote social equity.

Important Points

• Prime Minister Narendra Modi's Role:

• PM Modi has been instrumental in launching various schemes to foster rural development and financial inclusion.

• His focus on cooperative societies and self-help groups underscores the importance of grassroots-level economic empowerment.

• Key Features of Cooperative Societies:

• Operates on principles of mutual help and self-reliance.

• Provides loans, credit, and financial assistance at lower interest rates than traditional banks.

• Enhances community participation and promotes collective decision-making.

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Q96. Answer: (c) Simone Biles

The correct answer is Simone Biles.

Key Points

• Simone Biles, an American gymnast, received the Laureus World Sportswoman of the Year award in 2025, recognizing her exceptional achievements in gymnastics.

• Biles is considered one of the greatest gymnasts of all time, having won multiple Olympic gold medals and numerous World Championship titles.

• The Laureus World Sports Awards are prestigious annual awards honoring the greatest athletes and teams across various sports disciplines globally.

• Simone Biles was recognized for her remarkable performance in the sport despite facing personal challenges, which inspired athletes and fans worldwide.

• This accolade highlights her dedication, resilience, and unmatched skill in gymnastics, making her a global icon for sports excellence.

Additional Information

• Simone Biles:

• Born on March 14, 1997, in Columbus, Ohio, USA.

• Biles has won a record-breaking 25 World Championship medals, including 19 golds, making her the most decorated gymnast in history.

• She is known for her innovative routines and has multiple moves named after her, such as the "Biles" on floor and vault.

• In addition to her athletic achievements, Biles has been an advocate for mental health awareness, openly discussing her challenges during the Tokyo Olympics.

• Laureus World Sports Awards:

• Established in 2000, the awards celebrate the achievements of athletes across various sports disciplines.

• The Laureus Sportswoman of the Year award specifically honors the most outstanding female athlete based on performance and impact in the previous year.

• Winners are selected by the Laureus World Sports Academy, comprising legendary athletes and sports personalities.

• Other Nominees for 2025:

• Iga Świątek: Polish tennis player and winner of multiple Grand Slam titles.

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• Naomi Osaka: Japanese tennis player recognized for her dominance in women's tennis and advocacy for mental health.
• A'ja Wilson: American basketball player known for her stellar performances in the WNBA.
• Impact of Simone Biles:
• Her achievements have contributed significantly to the popularity and visibility of gymnastics worldwide.
• Biles serves as a role model for athletes, emphasizing the importance of perseverance, self-care, and excellence.

Important Points

• Simone Biles' Achievements:
• She has won 7 Olympic medals, including 4 golds, 1 silver, and 2 bronzes.
• Known for her difficulty and execution in routines, she has revolutionized gymnastics with her innovative techniques.
• Biles' advocacy for mental health has sparked discussions about athlete well-being and resilience.
• Legacy of Laureus Awards:
• These awards are regarded as the "Oscars" of sports, celebrating excellence and inspiring future generations.
• Past winners include iconic athletes such as Serena Williams, Usain Bolt, and Roger Federer.
• They recognize not only performance but also the impact athletes have on society through their platform.

Q97. Answer: (a) National Career Service Portal

The correct answer is National Career Service Portal.

Key Points

• Rapido, a leading bike-taxi aggregator, signed a Memorandum of Understanding (MoU) with the Ministry of Labour and Employment in April 2025.
• The MoU focuses on providing employment opportunities via the National Career Service (NCS) Portal, which is an initiative under the Ministry of Labour and Employment, Government of India.
• The National Career Service Portal is a comprehensive platform that connects job seekers with employers across multiple sectors, including unorganized and gig-based work.
• The platform aims to facilitate job creation and skill matching for individuals, especially in the age group of 16 to 60 years.
• This partnership aligns with the government's efforts to promote digital employment services and reduce unemployment by leveraging technology for job facilitation.
• The National Career Service (NCS) Portal also provides features like career counseling, skill development programs, and job fairs to enhance employability.

Additional Information

• National Career Service Portal:
• The NCS Portal was launched on July 20, 2015, by the Ministry of Labour and Employment.
• It acts as a one-stop platform for job seekers, employers, counselors, and training providers to connect and fulfill employment-related needs.
• The portal offers services such as job matching, career guidance, vocational training, and internships.
• It caters to various groups, including students, fresh graduates, experienced professionals, and those in the informal sector.
• As of 2023, the portal has registered more than 10 million job seekers and 1.5 lakh employers.
• Other Government Portals:
• Startup India Portal: This platform supports startups by providing resources like funding schemes, mentorship, and regulatory assistance. It was launched in 2016 under the Startup India Initiative.
• Digital India Portal: Aims to transform India into a digitally empowered society by offering e-governance services, digital literacy programs, and internet access in rural areas.
• Skill India Portal: Launched under the Skill India Mission in 2015, it focuses on enhancing vocational training and certifications to improve employability.
• Rapido:
• Rapido is a prominent bike taxi and delivery service in India, established in 2015.
• Its services cater to individuals seeking affordable and quick transportation across urban and semi-urban areas.
• By collaborating with government initiatives like the NCS Portal, Rapido contributes to job creation and the growth of the gig economy.

Important Points

• Key Functions of the National Career Service Portal:
• Provides real-time job matching based on a candidate's skills, experience, and preferences.
• Hosts job fairs across the country to connect employers and job seekers.
• Offers career counseling services through certified counselors and helpline support.

• Features an integrated platform for skill training programs in collaboration with the Skill India Mission.

• Enables job seekers to create detailed profiles and employers to post job openings.

• Gig Economy and Employment:

• The gig economy refers to a labor market characterized by short-term contracts and freelance work.

• Platforms like Rapido and others in the gig sector play a vital role in providing employment opportunities to youth and part-time workers.

• By integrating with government portals like the NCS, these platforms can enhance job accessibility and provide a structured approach to informal employment.

Q98. Answer: (d) 1960

The correct answer is 1960.

Key Points

• The Indus Water Treaty was signed between India and Pakistan in the year 1960. It was brokered by the World Bank.

• The treaty governs the utilization of the waters of the Indus River and its tributaries, which flow through both India and Pakistan.

• Under the treaty, the waters of the eastern rivers—Sutlej, Beas, and Ravi—are allocated to India, while the waters of the western rivers—Indus, Jhelum, and Chenab—are allocated to Pakistan.

• The treaty ensures that Pakistan receives about 80% of the water from the Indus river system, while India retains the remaining portion.

• The treaty is often cited as one of the most successful examples of water-sharing agreements in the world, even persisting through periods of conflict between India and Pakistan.

Additional Information

• Background of the Treaty:

• The treaty was signed on September 19, 1960, by the then Prime Minister of India, Jawaharlal Nehru, and the President of Pakistan, Ayub Khan.

• It was mediated by the World Bank after prolonged negotiations that began in the 1950s.

• The Indus river system consists of six rivers: Indus, Jhelum, Chenab, Ravi, Beas, and Sutlej, which originate in the Himalayas.

• Key Provisions of the Treaty:

• India was granted exclusive rights over the eastern rivers (Ravi, Beas, Sutlej) for purposes such as irrigation, power generation, and other consumptive uses.

• Pakistan was given control over the western rivers (Indus, Jhelum, Chenab), while India was allowed limited use for non-consumptive purposes like hydroelectric power generation and navigation.

• A Permanent Indus Commission was established to resolve disputes and ensure implementation of the treaty.

• Importance of the Treaty:

• The treaty has been critical in avoiding water conflicts between India and Pakistan, despite the hostility between the two nations.

• It is often hailed as one of the few successful bilateral agreements between India and Pakistan and is considered a model for resolving transboundary water disputes.

• Challenges to the Treaty:

• In recent years, there have been calls in India to review or suspend the treaty, especially after terrorist attacks allegedly supported by Pakistan.

• Climate change and increasing water demand have also added stress to the river system, raising concerns about the treaty's long-term sustainability.

Important Points

• Geographical Details:

• The Indus River originates in Tibet, near Lake Mansarovar, and flows through India and Pakistan before emptying into the Arabian Sea.

• The total length of the Indus River is approximately 3,180 km, making it one of the longest rivers in the world.

• Water Distribution:

• India uses the waters of the eastern rivers primarily for irrigation, domestic consumption, and hydropower projects.

• Pakistan relies heavily on the western rivers for agriculture, which is the backbone of its economy.

• Notable Disputes:

• In the past, Pakistan has raised objections to Indian projects like the Baglihar Dam on the Chenab River and the Kishanganga Hydroelectric Project on the Jhelum River.

• Such disputes have been addressed under the dispute resolution mechanisms provided by the treaty, including the use of neutral experts and international arbitration.

Q99. Answer: (d) Warsaw NATO Ministers' Summit

The correct answer is Warsaw NATO Ministers' Summit.

Key Points

• Warsaw NATO Ministers' Summit in 2025 was focused on the theme of "Securing Our Future" for Ukraine, amidst the ongoing geopolitical tensions in the region.

• The summit was instrumental in discussing and implementing security measures and strategies to support Ukraine in its struggle against Russian aggression.

• This high-level meeting involved NATO member states reaffirming their commitment to the principle of collective defense under Article 5 of the NATO Treaty.

• Key topics included strengthening Ukraine's military capabilities, providing humanitarian aid, and ensuring the sovereignty and territorial integrity of the country.

• The summit marked a significant milestone in enhancing NATO's role in the Eastern European security landscape and addressing emerging threats in the region.

Additional Information

• NATO's Role in Ukraine:

• NATO (North Atlantic Treaty Organization) has been actively involved in supporting Ukraine since the annexation of Crimea by Russia in 2014.

• It has provided extensive training programs, military aid, and advisory support to bolster Ukraine's defense capabilities.

• Ukraine has been recognized as a Enhanced Opportunities Partner by NATO, which allows closer cooperation in joint exercises and operations.

• - The Warsaw NATO Summit is a periodic meeting where leaders from NATO member states discuss critical issues related to international security and defense.

• The summit serves as a platform for formulating strategies to counter emerging global threats, including cyber warfare, terrorism, and regional conflicts.

• Support for Ukraine:

• Since the Russian invasion in 2022, NATO member countries have collectively provided billions of dollars in military aid to Ukraine.

• Support includes advanced weaponry such as anti-tank missiles, drones, and air defense systems, along with non-lethal aid like medical supplies and infrastructure rebuilding.

• Other Summits:

• Kiev Peace Conference: Focused on diplomatic efforts to establish peace in Ukraine but lacked significant military support discussions.

• London Summit on Ukraine: Primarily addressed economic aid and reconstruction efforts but did not emphasize defense strategies.

• Paris Peace Forum: Concentrated on broader global peace initiatives without a dedicated focus on Ukraine.

Important Points

• Article 5 of NATO:

• This article enshrines the principle of collective defense, stating that an attack on one member is considered an attack on all members.

• The article has been a cornerstone of NATO's commitment to maintaining international peace and security.

• Geopolitical Impact:

• The Warsaw NATO Summit highlighted the growing influence of NATO in countering Russian aggression in Eastern Europe.

• The summit underscored the need for global unity in addressing territorial sovereignty violations.

• Future Implications:

• The outcomes of the Warsaw Summit in 2025 are expected to shape NATO's long-term strategy in Eastern Europe.

• It also set a precedent for international collaboration to address similar conflicts globally.

Q100. Answer: (a) 8

The correct answer is 8.

Key Points

• The Energy Transition Index (ETI) is an annual ranking published by the World Economic Forum (WEF), assessing countries' energy systems' readiness for transition to sustainable energy sources.

• In the 2025 ETI, India dropped by 8 positions compared to the previous year's ranking, reflecting challenges in its energy transition efforts.

• The ETI evaluates countries on three core dimensions: energy security and access, environmental sustainability, and economic

development and growth.

• The significant drop in India's ranking could be attributed to factors such as increasing reliance on fossil fuels, slow progress in renewable energy integration, and challenges in energy policy implementation.

• India's efforts in renewable energy deployment, such as the National Solar Mission and commitments under the Paris Agreement, are notable. However, systemic challenges like grid infrastructure, financial viability, and energy equity have impacted its performance in the ETI.

Additional Information

• Energy Transition Index (ETI):

• The ETI is developed by the World Economic Forum (WEF) in collaboration with partners to track the progress of energy systems globally.

• It analyzes over 115 countries based on their current energy system performance and their readiness for transition.

• The index is based on metrics like energy affordability, sustainability, security, and accessibility.

• India's Renewable Energy Initiatives:

• India has set an ambitious target of achieving 500 GW of non-fossil fuel capacity by 2030.

• Programs like the National Solar Mission aim to install 100 GW of solar energy capacity by 2022 (extended targets under COP26).

• India is also promoting the use of wind energy, with a target of achieving 60 GW capacity.

• Challenges in India's Energy Transition:

• India's energy sector is still heavily reliant on coal, which contributes to carbon emissions and impacts environmental sustainability.

• Financial challenges, such as debts in the power distribution sector, hinder infrastructure development for renewable energy.

• Integration of renewables into the national grid remains a technical and logistical challenge.

• Global Energy Transition Trends:

• Countries like Sweden, Switzerland, and Finland have consistently ranked high on the ETI due to their focus on renewable energy, efficient energy use, and environmental policies.

• Developing countries face challenges in energy transition due to limited access to technology, financing, and policy frameworks.

Important Points

• World Economic Forum (WEF):

• The WEF is an international non-governmental organization headquartered in Geneva, Switzerland.

• It is widely known for its annual meeting in Davos, where global leaders in politics, business, and society discuss major global issues.

• Paris Agreement:

• The Paris Agreement is a landmark international treaty adopted in 2015 during the United Nations Climate Change Conference (COP21).

• It aims to limit global warming to below 2 degrees Celsius, with efforts to restrict it to 1.5 degrees Celsius above pre-industrial levels.

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