RRB Group D Official Paper (Held On: 26 Dec, 2025 Shift 2) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. Which of the following forms of energy will be possessed by a body of mass ‘m’ moving with a uniform velocity ‘v’?

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

Q2. Which of the following contrasting visible characters of garden peas are NOT used by Mendel?

(a) Tall/short plants
(b) Round/wrinkled seeds
(c) White/violet flowers
(d) Green/white seeds

Q3. Which of the following is/are used in poultry farming?

(a) Sardines
(b) Prawns
(c) Catla
(d) Leghorn breed

Q4. Atomic radius is usually measured in:

(a) centimetres
(b) decimetres
(c) nanometres
(d) milimetres

Q5. Which of the following statements is/are correct?

A) When a compound consists of a metal and a non-metal, the name or symbol of the metal is written first.
B) When a compound consists of a metal and a non-metal, the name or symbol of the non-metal is written first.
C) The valency or charges on the ion must balance.

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

Q6. A lens with a shorter focal length (f) has _____.

(a) Equal power as a lens with a longer focal length f
(b) Zero power
(c) More power
(d) Less power

Q7. The main iron gate of your building rusts over time due to:

(a) dirt
(b) high temperature
(c) pollution
(d) moisture and oxygen

Q8. Which of the following spiny seeds with hooks are dispersed by animals by attaching to their bodies?

(a) Madar
(b) Sunflower
(c) Drumstick
(d) Xanthium

Q9. A stone tied to a string and whirled in a circle exhibits _____.

(a) circular motion
(b) uniform straight-line motion
(c) linear motion with increasing speed
(d) non-uniform motion

Q10. The fundamental property that qualifies magnetic field as a vector quantity is that it possesses both _____.

(a) mass and density
(b) force and time
(c) charge and potential difference
(d) direction and magnitude

Q11. Fish have hearts with _____ chambers and their blood passes through the heart only _____ in one complete cycle.

(a) two; twice
(b) three; twice
(c) four; once
(d) two; once

Q12. Which of the following is NOT an example of inertia?

(a) Dust falling off a carpet when beaten
(b) A book sliding on a rough surface and stopping
(c) A ball rolling on a frictionless surface forever
(d) Passenger falling forward when a bus stops suddenly

Q13. Which of the following statements correctly explains the variety in the shape and size of cells?

(a) The shape and size of cells are identical in plants and animals.
(b) The shape and size of cells depend only on the availability of water.
(c) The shape and size of all cells remain constant in every organism.
(d) The shape and size of cells are related to the specific function they perform.

Q14. Which crop variety improvement method involves selecting parents with desirable traits and crossing them?

(a) Tissue Culture
(b) Genetic Engineering
(c) Hybridisation
(d) Mutation

Q15. Three resistors of 2 Ω, 3 Ω, and 5 Ω are connected in series. The total resistance is:

(a) 3.33 Ω
(b) 0.1 Ω
(c) 10 Ω
(d) 1 Ω

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Q16. When an object is moved slowly and gradually closer to a convex mirror from infinity towards the pole (P), what can we say about the image?

(a) Moves from the pole (P) towards the principal focus (F)
(b) Moves from the principal focus (F) towards the pole (P)
(c) Remains at the principal focus (F)
(d) Moves away from the mirror

Q17. A solid cube of wood has a density less than water. When it is placed in water, which of the following statements is correct?

(a) The cube will completely sink to the bottom.
(b) The cube will float with its entire volume above the water surface.
(c) The cube will float partially submerged, displacing water equal to its weight.
(d) The cube will remain suspended in the middle of water.

Q18. Metals low in the activity series, such as gold and silver, are typically found in their free state in nature, because:

(a) they react vigorously with acids
(b) they are highly reactive with oxygen and water
(c) they are very unreactive
(d) they have very low melting points

Q19. What is the dark layer that develops on silver upon its corrosion?

(a) Silver sulphide
(b) Zinc oxide
(c) Copper oxide
(d) Iron oxide

Q20. Which of the following is the correct reason for NOT being able to hear sound on the Moon?

(a) The Moon has craters.
(b) The Moon is very far away from the Earth.
(c) The Moon is very cold.
(d) The Moon has no atmosphere.

Q21. Which of the following analogies did Thomson use to describe his atomic model?

(a) Solar system
(b) Planetary system
(c) Nuclear core-shell
(d) Christmas pudding

Q22. Which of the following is an asexual method of reproduction in organisms like amoeba?

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

Q23. Why do epithelial tissues have very little space between their cells?

(a) To create an effective barrier regulating permeability of substances
(b) To allow rapid blood flow
(c) To facilitate movement of muscles
(d) To enable them to transmit electrical signals

Q24. Which of the following statements accurately describes the characteristic of electrons in an atom?

(a) They revolve around the nucleus in fixed orbits.
(b) They are located in the nucleus.
(c) They have the same mass as protons.
(d) They are positively charged.

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Q25. Select the correct reason as to why glucose and alcohol do NOT conduct electricity?

(a) The evaporate quickly.
(b) They are acidic in nature.
(c) They do not form ions in solution.
(d) They are made of metal.

MATHEMATICS

Q26. A girl goes to school at a speed of 9 km/hr. She comes back with a speed of 45 km/hr. Find her average speed for the whole journey.

(a) 22 km/hr
(b) 15 km/hr
(c) 20 km/hr
(d) 7 km/hr

Q27. What is the HCF of 32, 28, and 24?

(a) 4
(b) 2
(c) 6
(d) 8

Q28. The average age of 39 students of a class is 27 years. If the age of the teacher is also included, the average age of the whole group becomes 28 years. The age (in years) of the teacher is:

(a) 69
(b) 70
(c) 67
(d) 68

Q29. The sum of the present ages of a mother and daughter is 42 years. After 5 years, the mother will be 3 times as old as her daughter at that time. Find the ratio of the daughter's present age to the mother's age after 4 years.

(a) 4 : 17
(b) 6 : 19
(c) 4 : 19
(d) 6 : 17

Q30. The interior angle of a regular polygon is 156 °. How many sides does this polygon have?

(a) 15
(b) 14
(c) 12
(d) 13

Q31. The price of fuel decreases by 50 %, 30 % and 50 % in three successive months, but increases by 65 % in the fourth month. What is the percentage increase/decrease in the price of fuel in the fourth month as compared to its original price? (Rounded off to two decimal places)

(a) Decreases by 71.13 %
(b) Decreases by 75.87 %
(c) Increases by 67.43 %
(d) Increases by 72.43 %

Q32. The volume (in m^3) of a cube, each edge of which is 45 m, is:

(a) 91321
(b) 91057
(c) 91125
(d) 91128

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Q33. If 20% of 10% of 3/4 of a number is 882, find the number.

(a) 59780
(b) 62560
(c) 61960
(d) 58800

Q34. Rs. 2,037 is divided among Vikas, Tina, and Sumit in such a way that if Rs. 23, Rs. 42, and Rs. 52 are deducted from their respective shares, they have money in the ratio 14:19:15. Find the actual share of Tina.

(a) Rs. 660
(b) Rs. 910
(c) Rs. 610
(d) Rs. 802

Q35. Find the value of {(1/3)^(-2) - (1/2)^(-3)} ÷ (1/4)^(-2) + {((-3)/2)^4 × (5/3)^4}.

(a) 402/11
(b) 208/7
(c) 125/3
(d) 313/8

Q36. A dealer incurs a loss of 5% if he sells an article for Rs. 1805. At what price must he sell the article so as to gain 5% on that article?

(a) Rs. 1995
(b) Rs. 1985
(c) Rs. 2005
(d) Rs. 2105

Q37. A dealer allowed a 65% discount on an article and was still able to manage an 82% profit. Find the ratio of the cost price to the listed price.

(a) 7 : 32
(b) 2 : 33
(c) 6 : 29
(d) 5 : 26

Q38. The average speed of a car running at 70 km/hr for 1 hour and ‘ p ’ km/hr for 11/2 hours is 52 km/hr. Find the value of p.

(a) 40
(b) 60
(c) 52.5
(d) 57.5

Q39. A and B together can complete a piece of work in 12 days, B and C together can do it in 15 days, and C and A together can finish it in 20 days. Find the ratio of the number of days taken by B and C to complete the work individually.

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

Q40. If the marked price of an article is Rs. 2,400 and the discount is 16%, then the selling price of the article is:

(a) Rs. 2,166
(b) Rs. 2,060
(c) Rs. 2,216
(d) Rs. 2,016

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Q41. Find the sum of the squares of x and y, given that the number 83y547x is divisible by 72.

(a) 13
(b) 43
(c) 53
(d) 23

Q42. The average of 13 numbers is 92. If the first 7 numbers are 30, 32, 46, 81, 110, 73 and 20, then what will be the average of the remaining numbers?

(a) 139
(b) 135
(c) 131
(d) 134

Q43. 1/30 is what percentage of 2/70? (Round off the answer to two decimal places.)

(a) 116.67%
(b) 131.67%
(c) 233.33%
(d) 126.67%

Q44. Find the simple interest (in Rs.) on Rs. 2,000 at 7% per annum rate of interest for the period from 6 February 2023 to 20 April 2023.

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

Q45. A, B and C can do a piece of work in 2, 24 and 8 days, respectively. How long (in days) will they take to do twice the same work, working together?

(a) 3
(b) 6
(c) 9
(d) 4

Q46. At a stationery shop, the total cost of 2 red pens and 3 blue pens is Rs. 78. On the other hand, the total cost of 3 red pens and 2 blue pens is Rs. 72. What is the combined cost of one red pen and one blue pen?

(a) Rs. 26
(b) Rs. 36
(c) Rs. 30
(d) Rs. 33

Q47. The fourth proportion to 24, 3 and 16 is the same as the third proportion to A and 20. What is the value of A?4880

(a) 201
(b) 200
(c) 199
(d) 202

Q48. A hollow cylindrical pipe has an outer radius of 7 cm and an inner radius of 5 cm. If the pipe is 42 cm long and made of metal with a density of 5 g/cm³, what is the mass of the pipe?

(Use π = 22/7 and Density = Mass/Volume)

(a) 15.98 kg
(b) 15.56 kg
(c) 15.84 kg
(d) 15.72 kg

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Q49. If $\sin\theta = 3/5$, find the value of $\cos\theta$. (θ is in the first quadrant)

(a) 5/6
(b) 4/5
(c) 3/5
(d) 5/4

Q50. If $2x + 3y = 8$ and $4x^2 + 9y^2 = 32$, find the value of $8x^3 + 27y^3$.

(a) 128
(b) 142
(c) 112
(d) 106

GENERAL INTELLIGENCE & REASONING

Q51. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) US – ZS
(b) AY-DY
(c) QO – TO
(d) SQ-VQ

Q52. In a row of 54 people facing north, Mohit sits 22^(nd) from the right end. If Charu sits 15^(th) from the left end of the row, how many people sit between Mohit and Charu?

(a) 16
(b) 18
(c) 15
(d) 17

Q53. This question is based on the five, three-digit numbers given below.

(Left) 453 125 410 183 473 (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 third digit of the lowest number?

(a) 5
(b) 11
(c) 7
(d) 8

Q54. What should come in place of the question mark (?) in the given series?

32 40 31 41 ? 42

(a) 30
(b) 35
(c) 32
(d) 26

Q55. In a certain code language, ‘some good questions’ is coded as ‘jm ik cd’ and ‘many good problems’ is coded as ‘cd rc gh’. How is ‘good’ coded in that language?

(a) jm
(b) rc
(c) ik
(d) cd

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Q56. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

BOM DQL FSK HUJ ?

(a) JWI
(b) IWJ
(c) IVI
(d) JVI

Q57. If 1 is added to each odd digit and 1 is subtracted from each even digit in the number 3215674, what will be the difference between the highest and lowest digits in the new number thus formed?

(a) 4
(b) 5
(c) 7
(d) 6

Q58. 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 bananas are grapes.

No banana is a cucumber.

Conclusions:

(I): Some cucumbers are grapes.

(II): All grapes are cucumbers.

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

Q59. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) MQ - KO
(b) KO - IM
(c) PS - NR
(d) GK - EI

Q60. Select the pair which follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

HTU : LQY

PNC : TKG

(a) HCU : LAY
(b) SLZ : WGD
(c) XHK : BEO
(d) QYD : TUG

Q61. Sunil starts from point A and drives 64 km towards West. He then takes a left turn, drives 60 km, turns left and drives 67 km. He then takes a left turn and drives 78 km. He takes a final left turn, drives 3 km and stops at point P. How far (shortest distance) and towards which direction should he drive in order to reach point A again? (All turns are 90-degree turns only, unless specified.)

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

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Q62. In a certain code language, 'VALE' is coded as '3751' and 'ULVA' is coded as '1397'.What is the code for 'U' in the given code language?

(a) 7
(b) 1
(c) 9
(d) 3

Q63. Refer to the given number series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

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

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

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

Q64. Refer to the following number series and answer the question that follows (all numbers are single-digit numbers only).

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

How many numbers are perfect squares in the series (each number counted only once, regardless of repetitions)?

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

Q65. 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',

and A & B means 'A is the father of B'.

How is T related to M if 'T+O&RxN-M'?

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

Q66. Select the pair which follows the same pattern as that followed by the two set of pairs given below. Both pairs follow the same pattern.

AXB−FCG

IFJ−NKO

(a) WTX−BYC
(b) WSV−BYC
(c) WSV−AXB
(d) WTX−AYB

Q67. Read the given statement(s) and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statement(s).

Statements:

Some Hammers are Screwdrivers.

No Screwdrivers are Wrenches.

All Wrenches are Pliers.

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Conclusions:

(I) Some Wrenches are Screwdrivers.

(II) Some Screwdrivers are Pliers.

(a) Only conclusion (I) is true.
(b) Only conclusion (II) is true.
(c) Neither conclusion (I) nor (II) is true.
(d) Both conclusions (I) and (II) are true.

Q68. Which of the following number will replace the question mark (?) in the given series?

23, 24, 26, 32, 56, 176, ?

(a) 896
(b) 782
(c) 568
(d) 384

Q69. 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.)

(106, 368, 237)

(114, 336, 225)

(a) (246, 120, 186)
(b) (118, 256, 189)
(c) (304, 182, 253)
(d) (146, 302, 224)

Q70. KFHL is related to RMOS in a certain way based on the English alphabetical order. In the same way, MHJN is related to TOQU. To which of the given options is OJLP related, following the same logic?

(a) QVSW
(b) VQWS
(c) QVWS
(d) VQSW

Q71. In a row of all 97 students facing north, Mr. Akte is 9^(th) from the right end. If Mr. Memi is 18^(th) to the left of Mr. Akte, what is Mr. Memi's position from the left end of the row?

(a) 70th
(b) 72nd
(c) 69th
(d) 71st

Q72. Seven people - A, B, C, D, E, F and G are sitting in a straight line, facing north.

A sits fourth from the left end of the line. Only one person sits between A and B. Only three people sit between C and B. E sits third to the left of C. D sits second to the right of G.

How many people sit between A and F?

(a) Three
(b) One
(c) None
(d) Two

Q73. 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 7 9 2 2 7 9 9 9 4 7 7 8 9 1 8 6 2 1 2 2 8 (Right)

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

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(a) One
(b) None
(c) Three
(d) Two

Q74. Six people, G, H, I, Q, R and S, are sitting in a straight line, facing north. Only three people sit between Q and I. G sits to the immediate left of I. No one sits to the right of S. Only one person sits between S and G. R sits to the immediate right of H. How many people sit between I and R?

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

Q75. If 'P' stands for '×', 'Q' stands for '÷', 'R' stands for '−' and 'S' stands for '+', what will come in place of the question mark (?) in the following equation?

11 P 3 S (30 Q 5) P 2 R 15 S 6 P 2 = ?

(a) 31
(b) 54
(c) 42
(d) 62

Q76. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

CYB 48 DZC 53 EAD 58 FBE 63 ?

(a) GCF 68
(b) GBE 67
(c) GDE 68
(d) GHJ 67

Q77. What will come in place of the question mark (?) in the following equation if '+' and '−' are interchanged and '×' and '÷' are interchanged?

115 × 5 − 14 ÷ 6 + 15 = ?

(a) 92
(b) 84
(c) 70
(d) 78

Q78. Sunil starts from Point A and drives 57 km towards west. He then takes a left turn, drives 65 km, turns left and drives 67 km. He then takes a left turn and drives 78 km. He takes a final left turn, drives 10 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90 degrees turns only unless specified)

(a) 14 km to the north
(b) 13 km to the south
(c) 12 km to the south
(d) 15 km to the north

Q79. Six people, A, B, C, D, E and F, are sitting in a row, facing north. E sits to the immediate right of D. F sits fourth to the left of D. Only one person sits between B and D. C sits to the immediate left of B. A sits second to the left of E. Three of the following four options are alike in a certain way based on the given arrangement and thus form a group. Which is the option that DOES NOT belong to that group?

(a) FE
(b) BA
(c) CB
(d) AD

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

125 142 157 170 181 ?

(a) 193
(b) 187
(c) 191
(d) 190

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. In February 2025, the Union Budget 2025–26 announced the establishment of which board in Bihar?

(a) Foxnut Development Board
(b) Bihar Agricultural Processing Board
(c) Makhana Board
(d) Eastern Food Processing Board

Q82. In September 2025, ISRO, IN-SPACe and NewSpace India Limited (NSIL) jointly signed the 100th technology transfer agreement for Small Satellite Launch Vehicle (SSLV) production. Which organisation partnered with them for manufacturing?

(a) BHEL Aerospace Division
(b) Hindustan Aeronautics Limited
(c) L&T Defence
(d) Bharat Electronics Ltd.

Q83. How many sports were featured in the Khelo India Youth Games, 2025?

(a) 30
(b) 29
(c) 28
(d) 27

Q84. When was the UNDP Human Development Report 2025, based on 2023 data, released?

(a) 1 June 2025
(b) 6 May 2025
(c) 20 March 2025
(d) 22 April 2025

Q85. The Fit India Movement's premier cycling event, promoting fitness and pollution solutions, was staged at Mumbai's Gateway of India in February 2025, under what name?

(a) Fit India Cycling Marathon
(b) Wheels for Wellness
(c) Cycle for Health
(d) Sundays on Cycle

Q86. Who received the Sahitya Akademi Translation Prize 2024 (awarded in March 2025) for translating a Malayalam autobiography into Tamil?

(a) Chandan Negi
(b) Uttara Bwiswmuthiary
(c) P Vimala
(d) Madan Soni

Q87. During the National Conference on ‘Opportunities of Defence Manufacturing in the Country’ (October 7, 2025), which new portal was launched in India to streamline export and import authorisations in the defence sector?

(a) Mission Indigenisation Portal
(b) Make in India Portal
(c) Defence Exim Portal
(d) Bharat Tech Portal

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Q88. The International Big Cat Alliance became a treaty-based organisation in January 2025. Under which ministry does it operate?

(a) Ministry of Tourism
(b) Ministry of Fisheries, Animal Husbandry and Dairying
(c) Ministry of Environment, Forest & Climate Change
(d) Ministry of Jal Shakti

Q89. As per the Reserve Bank of India (RBI) guidelines, in the event of a name change by a bank (as happened with North East Small Finance Bank Limited in May 2025), existing cheque books and IFSC codes will _____.

(a) become invalid
(b) remain valid
(c) be temporarily suspended
(d) require re-issuance

Q90. Which of the following agencies conducted maiden flight-tests of an Integrated Air Defence Weapon System in August 2025?

(a) Indian Space Research Organisation (ISRO)
(b) Defence Space Agency (DSA)
(c) National Defence Academy (NDA)
(d) Defence Research and Development Organisation (DRDO)

Q91. On which date is International Sex Workers' Day observed annually in India?

(a) 2 June
(b) 10 May
(c) 3 May
(d) 11 June

Q92. Which of the following platforms was the venue where Indian Prime Minister Narendra Modi announced the resumption of India-China direct flights after more than five years in August 2025?

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

Q93. What is the rank of India in the World Economic Forum’s 2025 Energy Transition Index?

(a) 61st
(b) 81st
(c) 91st
(d) 71st

Q94. Which of the following Indian states conducted a large-scale disaster drill in November 2025, focusing on oil and chemical disaster preparedness at major industrial hubs?

(a) Gujarat
(b) Maharashtra
(c) Tamil Nadu
(d) West Bengal

Q95. Where were the 2025 World Athletics Indoor Championships held?

(a) Portland, USA
(b) Doha, Qatar
(c) Birmingham, UK
(d) Nanjing, China

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Q96. According to the PIB release 'Proactive Measures taken by CAQM to contain Air Pollution' (10 November 2025), farm fire incidents in Haryana between 15 September and 9 November 2025 fell by roughly what percentage compared to the same period in 2024?

(a) About 35%
(b) About 65%
(c) About 45%
(d) About 25%

Q97. When and where will the 2025 Ballon d'Or ceremony take place?

(a) July in London
(b) September in Paris
(c) June in Rome
(d) October in Madrid

Q98. Which summit in July 2025 emphasised Global South cooperation under Brazil's chairmanship?

(a) G7 Summit
(b) APEC Summit
(c) BRICS Summit
(d) ASEAN Summit

Q99. As per the World Bank's Spring 2025 report, how many people did India lift out of extreme poverty over the past decade?

(a) 171 million
(b) 250 million
(c) 211 million
(d) 100 million

Q100. The Digi Yatra, which is a product for citizens by the Ministry of Civil Aviation, received the National e-Governance Award in 2025 in which category?

(a) Bronze
(b) Gold
(c) Silver
(d) Jury

ANSWER KEY

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

SOLUTIONS

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Q1. Answer: (d) Kinetic Energy

The correct answer is Kinetic Energy.

Key Points

• Kinetic Energy is defined as the energy possessed by an object due to its motion. Any object that has mass and is moving possesses this form of energy.

• For a body of mass ‘m’ moving with a uniform velocity ‘v’, the Kinetic Energy (K.E.) is mathematically expressed by the formula: K.E. = 1/2 mv^2.

• Since the question specifies the body has a mass and is in motion with a velocity, it directly satisfies the conditions for possessing Kinetic Energy. Hence, the correct answer is Kinetic Energy.

• Kinetic Energy is a scalar quantity, which means it has magnitude but no specific direction. The SI unit of energy, including kinetic energy, is the Joule (J), which is equivalent to 1 $kg \cdot m^2/s^2$.

• The amount of Kinetic Energy depends on two factors: the mass of the object and the square of its velocity. If the velocity is zero, the Kinetic Energy will also be zero.

Additional Information

• Potential Energy:

• This is the energy held by an object because of its position relative to others, stresses within itself, or its electric charge.

• The most common form is Gravitational Potential Energy, calculated as P.E. = mgh, where g is the acceleration due to gravity and h is the height. Hence, statement 3 is incorrect in the context of a body moving with uniform velocity on a level plane.

• Heat Energy:

• Also known as Thermal Energy, it is the result of the microscopic motion of atoms and molecules within a substance.

• It is transferred between systems due to a temperature difference. Hence, statement 1 is incorrect.

• Sound Energy:

• This form of energy is associated with the vibration of matter. It travels through a medium as mechanical waves.

• It is typically produced when a force causes an object or substance to vibrate. Hence, statement 2 is incorrect.

• Mechanical Energy:

• The total mechanical energy of an object is the sum of its Kinetic Energy and Potential Energy.

• In the absence of friction or other non-conservative forces, the total mechanical energy of a system remains constant.

Important Points

• Work-Energy Theorem: This principle states that the net work done by all forces acting on a body is equal to the change in its Kinetic Energy. This provides a direct link between force, displacement, and motion.

• Velocity Dependency: Because the formula involves v^2, doubling the velocity of an object will increase its Kinetic Energy by four times ($2^2 = 4$). Conversely, doubling the mass only doubles the kinetic energy.

• Types of Kinetic Energy: Beyond simple translation (moving from point A to B), kinetic energy can be rotational (spinning) or vibrational.

• Law of Conservation of Energy: Energy can neither be created nor destroyed, but only transformed from one form to another. For example, a falling object converts its Potential Energy into Kinetic Energy as its velocity increases.

Q2. Answer: (d) Green/white seeds

The correct answer is Green/white seeds.

Key Points

• Gregor Mendel, known as the father of genetics, conducted hybridization experiments on garden peas (Pisum sativum) for seven years between 1856 and 1863.

• He selected seven pairs of contrasting visible characters to study the laws of inheritance. One of these traits was stem height, where he compared Tall and Short (Dwarf) plants. Hence, statement 1 is correct.

• Mendel studied the shape of the seeds, using Round (dominant) and Wrinkled (recessive) as the contrasting pair. Hence, statement 2 is correct.

• For flower color, he observed Violet and White flowers, where violet was the dominant trait and white was the recessive trait. Hence, statement 3 is correct.

• Regarding seed color, Mendel used Yellow (dominant) and Green (recessive) seeds. He did not use "white" as a contrasting character for seed color, as white was specifically a trait for flowers. Hence, statement 4 is incorrect.

• Other traits included pod shape (Inflated/Constricted), pod color (Green/Yellow), and flower position (Axial/Terminal).

Additional Information

• Selection of Pea Plant: Mendel chose the garden pea (Pisum sativum) because it was easy to grow, had a short life cycle, and possessed clearly distinguishable contrasting characters. The plants also allowed for both self-pollination and cross-pollination.

• Mendel's Laws: Based on his observations, he proposed the Law of Dominance, the Law of Segregation, and the Law of

Independent Assortment.

• Dominant and Recessive: In each of the seven traits, one form always masked the other in the first generation (F1). The trait that appeared was called Dominant, while the hidden trait was Recessive.

• Statistical Analysis: Mendel was one of the first biologists to use mathematics and statistical analysis to explain biological phenomena, which was a revolutionary approach in the 19th century.

• Publication: His work was published in 1866 under the title "Experiments on Plant Hybridization," but its significance was only recognized in 1900 after his death.

Important Points

• Seed Color vs Pod Color: It is important to note the distinction between seed color and pod color in Mendel's study. For Seed Color, Yellow is dominant and Green is recessive. However, for Pod Color, Green is dominant and Yellow is recessive.

• Number of Traits: Mendel strictly worked with 14 true-breeding pea plant varieties, which corresponded to 7 pairs of contrasting traits.

• Genotype and Phenotype: Mendel's experiments laid the foundation for understanding Genotype (genetic makeup) and Phenotype (physical appearance), terms that were coined later by other scientists.

• Recognition: His findings were rediscovered in 1900 by three scientists: Hugo de Vries, Carl Correns, and Erich von Tschermak, working independently.

Q3. Answer: (d) Leghorn breed

The correct answer is Leghorn breed.

Key Points

• Leghorn is a world-famous breed of chicken that originated in Tuscany, in central Italy. It is one of the most popular breeds used in commercial poultry farming worldwide.

• It is specifically utilized for egg production and is classified as a Layer breed. These birds are known for their high fecundity, with a single hen capable of laying an average of 280 to 300 white eggs per year.

• In poultry management, Leghorns are preferred because they have an excellent feed-to-egg conversion ratio, meaning they require less feed to produce a large number of eggs compared to other heavier breeds.

• The breed was first exported to North America in 1828 and subsequently to other parts of the world. They are characterized by their white plumage, yellow legs, and white earlobes.

• Other options like Sardines, Prawns, and Catla are all aquatic organisms and are associated with fisheries, pisciculture, or aquaculture, rather than poultry farming.

Additional Information

• Poultry Farming:

• It is the practice of raising domesticated birds such as chickens, turkeys, ducks, and geese for the purpose of farming meat or eggs for food.

• Breeds are generally categorized into Broilers (raised for meat) and Layers (raised for eggs). Common examples include Rhode Island Red and Plymouth Rock.

• Sardines:

• These are small, epipelagic fish that belong to the family Clupeidae. They are rich in omega-3 fatty acids and are found in marine environments.

• They are a major component of the global fishing industry and are used for human consumption, fish oil, and animal feed.

• Prawns:

• Prawns are crustaceans belonging to the suborder Dendrobranchiata. Their cultivation is known as shrimp farming or aquaculture.

• They can be found in both freshwater and saltwater habitats and are a significant export commodity for many countries, including India.

• Catla:

• Scientifically named Labeo catla, it is an economically important South Asian freshwater fish in the carp family.

• It is a surface feeder and is one of the three Indian Major Carps (along with Rohu and Mrigal) used extensively in pisciculture.

Important Points

• Indigenous Breeds: In India, Aseel is a well-known indigenous breed used for meat and traditional cockfighting due to its high stamina and pugnacity.

• Dual-Purpose Breeds: Some breeds like the Rhode Island Red are used for both meat and egg production, making them versatile for small-scale poultry farmers.

• Disease Management: Poultry farming requires strict biosecurity measures to prevent outbreaks of diseases like Avian Influenza (Bird Flu) and Ranikhet disease.

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Q4. Answer: (c) nanometres

The correct answer is nanometres.

Key Points

• Atomic radius is defined as the total distance from an atom's nucleus to the outermost orbital of electrons.

• Because atoms are incredibly small entities, their dimensions cannot be measured using standard units like centimetres, decimetres, or millimetres, which are meant for macroscopic objects.

• The nanometre (nm) is a unit of length in the metric system, equal to one-billionth of a metre (10^-^9 m). It is the standard unit used to express dimensions on an atomic scale.

• Typical atomic radii range from approximately 0.03 nm to 0.3 nm. For example, the hydrogen atom has a radius of about 0.053 nm.

• The choice of nanometres allows scientists to work with manageable numerical values when describing the size of atoms and molecules.

Additional Information

• Periodic Trends in Atomic Radius:

• Across a Period: The atomic radius generally decreases from left to right. This happens because the effective nuclear charge increases, pulling the electron cloud closer to the nucleus.

• Down a Group: The atomic radius increases as you move down a column. This is due to the addition of new principal energy levels or electron shells, which increases the distance between the nucleus and the valence electrons.

• Types of Atomic Radii:

• Covalent Radius: Half the distance between the nuclei of two identical atoms joined by a single covalent bond.

• Metallic Radius: Half the distance between the nuclei of two adjacent metal atoms in a metallic lattice.

• Van der Waals Radius: Half the distance between the nuclei of two non-bonded, isolated atoms in their closest possible approach.

• Alternative Units:

• Another very common unit used for atomic dimensions is the Angstrom (Å). One Angstrom is equal to 10^-¹^0 metres or 0.1 nanometres.

• The picometre (pm) is also frequently used in modern chemistry, where 1 pm = 10^-¹² metres. 1 nanometre is equal to 1000 picometres.

Important Points

• Scale Comparisons:

• Centimetre: 10^-² metres. Used for everyday objects like stationery.

• Millimetre: 10^-³ metres. Used for small mechanical components.

• Nanometre: 10^-^9 metres. Essential for Nanotechnology and Quantum Physics.

• Measurement Techniques: Scientists determine the atomic radius using techniques such as X-ray crystallography or electron diffraction, which provide data on the distance between atomic nuclei in various substances.

Q5. Answer: (d) Only A and C

The correct answer is Only A and C.

Key Points

• When a chemical compound is formed from a metal and a non-metal, the symbol or name of the metal is written first in the chemical formula. This follows the IUPAC (International Union of Pure and Applied Chemistry) nomenclature rules where the electropositive element (metal) precedes the electronegative element (non-metal). Hence, statement A is correct.

• Conversely, writing the non-metal name or symbol first is incorrect according to standard chemical conventions. In a formula like NaCl, the Sodium (metal) is placed before Chlorine (non-metal). Writing it as ClNa would be systematically wrong. Hence, statement B is incorrect.

• For any ionic compound to be stable, the total valency or electrical charges on the ions must be perfectly balanced. The sum of the positive charges from cations and negative charges from anions must equal zero to maintain electrical neutrality. Hence, statement C is correct.

• Hence, the correct answer is Only A and C.

Additional Information

• Rules for Writing Chemical Formulae:

• The valencies or charges on the ion must be balanced. In compounds formed with polyatomic ions, the ion is enclosed in a bracket before writing the number to indicate the ratio, if the number is greater than one.

• When a compound consists of a metal and a non-metal, the name or symbol of the metal is written first. For example: Calcium Oxide (CaO), Sodium Chloride (NaCl), Iron Sulphide (FeS), and Copper Oxide (CuO).

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• In these examples, Oxygen, Chlorine, and Sulphur are non-metals and are written on the right, whereas Calcium, Sodium, Iron, and Copper are metals and are written on the left.

• Valency:

• Valency is defined as the combining capacity of an atom or an element. It determines how the atoms of one element will combine with the atoms of another element to form a chemical compound.

• For example, the valency of Magnesium is 2 and Chlorine is 1. To balance the charges in Magnesium Chloride, two chlorine atoms are needed for every one magnesium atom, resulting in the formula $MgCl_2$.

Important Points

• Criss-cross Method:

• A common method to write the formula of a binary compound is the criss-cross method. In this, the valency of each atom is written below its symbol, and then the valencies are crossed over to the other atom as subscripts.

• Example: For Aluminium Oxide, the symbol for Aluminium is Al (valency +3) and Oxygen is O (valency -2). Crossing them gives Al_2O_3.

• Naming Non-metals:

• In binary compounds (compounds containing two different elements), the non-metal is usually given the suffix "-ide". Examples include Oxide, Chloride, Nitride, and Bromide.

Q6. Answer: (c) More power

The correct answer is More power.

Key Points

• The Power of a lens is defined as the ability of the lens to converge or diverge light rays falling on it.

• It is mathematically defined as the reciprocal of the focal length (f) of the lens. The formula is given by $P = 1/f$, where f is measured in meters.

• Because of this inverse relationship, as the focal length of a lens decreases, its power increases. Hence, a lens with a shorter focal length has more power.

• A lens with a shorter focal length has more curvature, which allows it to bend light rays more sharply, leading to a higher degree of convergence or divergence.

• Conversely, a lens with a longer focal length is flatter and bends light rays less, meaning it has less power. Hence, statement 4 is incorrect while statement 3 is correct.

Additional Information

• SI Unit of Power: The standard unit for measuring the power of an optical lens is the Dioptre, represented by the symbol D. 1 Dioptre is equal to 1 m^{-1}.

• Convex Lens (Converging): These lenses have a positive focal length according to the sign convention. Consequently, the power of a convex lens is always positive. They are used to treat Hypermetropia (farsightedness).

• Concave Lens (Diverging): These lenses have a negative focal length. Therefore, the power of a concave lens is always negative. These are typically used to correct Myopia (nearsightedness).

• Nature of Light Bending: Power is a measure of the "strength" of a lens. A lens that can focus light at a very short distance from its optical center is considered more powerful than one that focuses light far away.

Important Points

• Lens Combination: When multiple thin lenses are placed in contact with each other, the net power (P) of the system is the algebraic sum of the powers of the individual lenses ($P = P1 + P2 + P3...$).

• Refractive Index: The power of a lens also depends on the refractive index of the material it is made of and the medium in which it is placed. If a lens is placed in a medium with a high refractive index, its focal length changes, thereby altering its power.

• Eye Health: Optometrists prescribe corrective glasses by mentioning the power in Dioptres. For example, a prescription of +2.0 D indicates a convex lens, whereas -2.0 D indicates a concave lens.

• Magnification: While power relates to the bending of light, magnification refers to the ratio of the height of the image to the height of the object. High-power lenses often provide higher magnification in simple microscopes.

Q7. Answer: (d) moisture and oxygen

The correct answer is moisture and oxygen.

Key Points

• Rusting is a chemical process that leads to the corrosion of iron. It occurs when iron surfaces react with oxygen and moisture (water or water vapor) present in the atmosphere.

• For rusting to take place, both oxygen and moisture are essential. If iron is kept in completely dry air or in distilled water without air, it will not rust. Hence, statement 4 is correct.

• While dirt may collect on the surface and hold moisture, it is not a primary chemical reactant in the formation of rust. Hence,

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statement 1 is incorrect.

• High temperature can increase the speed of the chemical reaction (rusting), but it is not the fundamental cause of the process itself. Hence, statement 2 is incorrect.

• Pollution, specifically the presence of gases like sulfur dioxide or nitrogen oxides, can accelerate the rate of corrosion, but they are not the basic requirements like air and water. Hence, statement 3 is incorrect.

• The chemical product of this reaction is Hydrated Iron (III) Oxide, which appears as a reddish-brown, flaky substance on the surface of the metal.

Additional Information

• The Chemistry of Rusting:

• Rusting is an oxidation reaction where iron (Fe) loses electrons to oxygen.

• The presence of electrolytes (like salt in seawater) can significantly speed up the rusting process because they increase the conductivity of water.

• Prevention Methods:

• Galvanization: This involves coating iron or steel with a thin layer of Zinc to prevent oxygen and water from reaching the iron.

• Painting and Oiling: These create a protective barrier on the metal surface to exclude moisture and air.

• Alloying: Mixing iron with other metals like Chromium and Nickel produces Stainless Steel, which is highly resistant to rusting.

• Metal Properties:

• Iron is a transition metal with the chemical symbol Fe and an atomic number of 26.

• Unlike iron, some metals like Aluminum form a protective oxide layer that prevents further corrosion, whereas rust on iron is porous and allows the reaction to continue deeper into the metal.

Important Points

• Environmental Factors:

• Humidity: Higher levels of humidity in coastal areas lead to faster rusting compared to desert regions.

• Acid Rain: The presence of acids in rain (due to pollution) lowers the pH level, which drastically increases the corrosion rate of iron structures and monuments.

• Economic Impact:

• Rusting causes massive economic losses globally every year by damaging bridges, buildings, ships, and industrial machinery, necessitating regular maintenance and replacement.

Q8. Answer: (d) Xanthium

The correct answer is Xanthium.

Key Points

• Seed dispersal is the process by which seeds are carried away from the parent plant to new locations to reduce competition for sunlight, water, and minerals.

• Certain plants have evolved specific structures like hooks, spines, or barbs to facilitate dispersal by animals. This specific mechanism is known as epizoochory.

• Xanthium (commonly known as Cocklebur) produces seeds that are encased in a spiny bur. These spines end in hooks that easily attach to the fur of animals or the clothing of humans passing by.

• Once attached, these seeds can be transported over long distances before they eventually fall off or are removed, allowing the plant to colonize new habitats. Hence, the correct answer is Xanthium.

• Other plants mentioned, like Madar and Drumstick, do not use hooks; Madar uses hairy seeds for wind dispersal, and Drumstick uses winged seeds.

Additional Information

• Dispersal by Wind (Anemochory):

• Plants that disperse seeds through wind often have lightweight seeds or special structures to catch the breeze.

• Drumstick seeds have wings that help them glide through the air.

• Madar (Calotropis) and Sunflower (Auchenes) often possess hairy outgrowths (pappus) that act like small parachutes to stay buoyant in the wind.

• Maple is another common example of a plant with winged seeds.

• Dispersal by Water (Hydrochory):

• Seeds or fruits dispersed by water usually develop floating abilities.

• The Coconut has a fibrous outer coat that allows it to float on seawater and travel between islands or coastal regions.

• Lotus fruits have a spongy part that helps them stay afloat in freshwater bodies.

• Dispersal by Animals (Zoochory):

• This can happen through ingestion (animals eating fleshy fruits and excreting seeds) or attachment.

• Urena and Xanthium are primary examples of seeds with hooks for attachment.

• Birds often disperse seeds of fleshy fruits like guava or berries after consuming them.

• Dispersal by Explosion (Autochory):

• Some plants have fruits that burst open with a sudden jerk, scattering seeds far from the mother plant.

• Examples include Balsam, Castor, and Pea pods.

Important Points

• The Xanthium plant belongs to the family Asteraceae. It is often considered a weed in many parts of the world, including India and North America.

• The hooks on Xanthium were the original inspiration for the invention of Velcro by George de Mestral in the 1940s, after he observed how the burs stuck to his dog's fur.

• Effective seed dispersal prevents overcrowding and allows plants to inhabit different geographical locations and climatic zones.

• The number of seeds produced and the efficiency of the dispersal agent (wind, water, or animals) directly impact the survival rate of the plant species.

Q9. Answer: (a) circular motion

The correct answer is circular motion.

Key Points

• Circular motion is defined as the movement of an object along the circumference of a circle or rotation along a circular path. When a stone tied to a string is whirled, it travels in a circle centered at the point where the string is held. Hence, statement 1 is correct.

• In this scenario, the string provides a tension force that acts toward the center of the circle. This force is known as the centripetal force, which continuously changes the direction of the stone's motion without necessarily changing its speed.

• Even if the stone is whirled at a constant speed, its velocity is constantly changing because velocity is a vector quantity that depends on both magnitude and direction. Since the direction changes at every point along the circle, the motion is considered accelerated.

• The path of the stone is not a straight line; therefore, it does not exhibit uniform straight-line motion or linear motion. Hence, statements 2 and 3 are incorrect.

• While the motion can be non-uniform if the speed changes, the most fundamental description of a stone whirled in a circle is circular motion. Hence, statement 4 is less specific than statement 1.

Additional Information

• Centripetal Force: This is the external force required to maintain circular motion. For a stone on a string, the tension (T) equals the mass (m) times the square of the velocity (v) divided by the radius (r) of the path ($T = mv^2/r$).

• Uniform Circular Motion (UCM): If the speed of the stone remains constant as it moves in a circle, it is called Uniform Circular Motion. In UCM, the acceleration is always directed toward the center (centripetal acceleration).

• Tangential Velocity: At any instant, the direction of the stone's motion is along the tangent to the circular path at that point. If the string suddenly breaks, the stone will fly off in a straight line along that tangent due to inertia.

• Angular Velocity: This refers to the rate of change of the angle subtended by the object at the center of the circle, usually measured in radians per second (rad/s).

Important Points

• Real-world Examples: Other common examples of circular motion include the Moon revolving around the Earth, electrons orbiting a nucleus, and a car taking a turn on a curved road.

• Work Done: In Uniform Circular Motion, the work done by the centripetal force is always zero because the force is perpendicular to the displacement (tangent) at every point.

• Inertia of Direction: The tendency of an object to resist changes in its direction is what necessitates the continuous application of force (tension) to keep the stone in its circular path.

Q10. Answer: (d) direction and magnitude

The correct answer is direction and magnitude.

Key Points

• A vector quantity is defined as a physical quantity that is completely specified by both a magnitude (its size or numerical value) and a direction. Since the magnetic field exerts a force that depends on the direction of motion of a charge, it is classified as a vector quantity.

• The magnetic field, represented by the symbol B, is a region around a magnetic material or a moving electric charge within which the force of magnetism acts.

• The direction of the magnetic field at any point is the direction in which the north pole of a compass needle points when placed at

that location.

• In physics, quantities like force, velocity, acceleration, and displacement are all vectors because they cannot be fully described without mentioning which way they are acting.

• The SI unit of magnetic field strength (magnetic flux density) is the Tesla (T), named after Nikola Tesla. Another common unit used in the CGS system is the Gauss (G), where 1 Tesla equals 10,000 Gauss.

Additional Information

• Scalar Quantities:

• Unlike vectors, scalar quantities possess only magnitude and no direction. Examples include mass, density, time, temperature, and electric potential. Hence, options 1, 2, and 3 are incorrect as they involve scalar properties.

• Magnetic Field Lines:

• These are imaginary lines used to represent a magnetic field. They emerge from the North Pole and enter the South Pole outside a magnet, forming continuous closed loops.

• The density of these lines indicates the magnitude of the field; where lines are closer, the field is stronger.

• Sources of Magnetic Fields:

• Magnetic fields are produced by moving electric charges (currents) and the intrinsic magnetic moments of elementary particles associated with a fundamental quantum property known as spin.

• In 1820, Hans Christian Ørsted discovered that an electric current creates a magnetic field, a discovery that unified electricity and magnetism into electromagnetism.

Important Points

• Lorentz Force: The vector nature of the magnetic field is evident in the Lorentz Force equation, where the force F on a charge q moving with velocity v is given by F = q(v x B). The cross product indicates that the force is perpendicular to both the velocity and the field.

• Right-Hand Thumb Rule: This rule is used to find the direction of the magnetic field around a straight current-carrying wire. If the thumb points in the direction of the current, the curled fingers show the direction of the magnetic field lines.

• Earth's Magnetic Field: The Earth acts like a giant bar magnet. Its magnetic field protects the planet from solar wind and is essential for navigation using a magnetic compass.

• Magnetic Flux: It is the total magnetic field passing through a given area and is a scalar quantity, measured in Webers (Wb).

Q11. Answer: (d) two; once

The correct answer is two; once.

Key Points

• Fish possess a heart that consists of only two chambers: one atrium and one ventricle. Hence, the first part of the statement is correct.

• In the circulatory system of a fish, the heart pumps deoxygenated blood toward the gills for oxygenation.

• Once the blood is oxygenated at the gills, it does not return to the heart immediately; instead, it flows directly to the rest of the body tissues.

• Because the blood passes through the heart only once during a complete circuit of the body, this type of system is known as single circulation. Hence, the second part of the statement is correct.

• This single circulatory system is efficient enough to meet the metabolic demands of ectothermic (cold-blooded) aquatic organisms like fish.

Additional Information

• Three-Chambered Hearts:

• Amphibians and most reptiles (such as lizards and snakes) have a three-chambered heart consisting of two atria and one ventricle.

• In these animals, blood follows a double circulation pattern, but it is incomplete because oxygenated and deoxygenated blood mix to some extent in the single ventricle.

• Four-Chambered Hearts:

• Birds and mammals (including humans) possess a four-chambered heart with two atria and two ventricles.

• This structure ensures a complete separation of oxygenated and deoxygenated blood, allowing for highly efficient oxygen delivery required for endothermic (warm-blooded) lifestyles.

• Double Circulation:

• In double circulation, blood passes through the heart twice during one complete cycle: once through the pulmonary circuit (to the lungs) and once through the systemic circuit (to the body).

Important Points

• Venous Heart: The heart of a fish is often referred to as a venous heart because it only ever contains deoxygenated blood.

• Accessory Structures: While the main heart has two chambers, fish also have associated structures like the sinus venosus (which receives blood) and the conus arteriosus or bulbus arteriosus (which helps regulate blood flow out of the ventricle).

• Metabolic Rate: The single circulation system results in lower blood pressure in the systemic organs because the pressure drops significantly as blood passes through the narrow capillaries of the gills.

• Evolutionary Context: The transition from single circulation in fish to double circulation in land vertebrates is a key evolutionary milestone that supported higher metabolic rates and thermoregulation.

Q12. Answer: (b) A book sliding on a rough surface and stopping

The correct answer is A book sliding on a rough surface and stopping.

Key Points

• Inertia is the inherent property of an object by virtue of which it resists any change in its state of rest or uniform motion in a straight line. It was first conceptualized by Galileo Galilei and later formalized by Isaac Newton.

• Dust falling off a carpet when beaten: When a carpet is beaten with a stick, the carpet fibers move forward suddenly. However, the dust particles tend to remain in their state of rest due to inertia of rest. As a result, the dust separates from the carpet and falls down. Hence, statement 1 is an example of inertia.

• A book sliding on a rough surface and stopping: According to Newton's First Law, an object in motion will stay in motion unless acted upon by an external unbalanced force. In this case, the force of friction provided by the rough surface acts as that external force which opposes the motion and brings the book to a halt. The stopping is a result of an external force overcoming inertia, not an example of the property of inertia itself. Hence, statement 2 is NOT an example of inertia.

• A ball rolling on a frictionless surface forever: This is a classic theoretical example of inertia of motion. In the absence of any external force like friction or air resistance, the ball's inertia ensures that it maintains its state of uniform motion indefinitely. Hence, statement 3 is an example of inertia.

• Passenger falling forward when a bus stops suddenly: When a moving bus stops, the lower part of the passenger's body, which is in contact with the bus, comes to rest immediately. However, the upper part of the body continues to move forward due to inertia of motion, causing the passenger to lurch forward. Hence, statement 4 is an example of inertia.

Additional Information

• Newton's First Law of Motion: Often referred to as the Law of Inertia, it states that every body continues in its state of rest or of uniform motion in a straight line unless it is compelled by some external force to change that state.

• Mass and Inertia: The mass of an object is a quantitative measure of its inertia. An object with a larger mass has more inertia and requires a greater force to change its state of motion compared to an object with lesser mass. For example, it is harder to stop a moving truck than a bicycle moving at the same speed.

• Types of Inertia:

• Inertia of Rest: The inability of a body to change by itself its state of rest. Example: When a branch of a tree is shaken, the fruits fall off because they stay at rest while the branch moves.

• Inertia of Motion: The inability of a body to change by itself its state of uniform motion. Example: An athlete runs some distance before taking a long jump to gain momentum and utilize inertia.

• Inertia of Direction: The inability of a body to change by itself its direction of motion. Example: When a car rounds a sharp curve, the passengers are thrown toward the outside of the curve.

• Force of Friction: This is a contact force that always opposes the relative motion between two surfaces. On a rough surface, the magnitude of friction is high, which leads to the rapid deceleration of moving objects, effectively counteracting their inertia.

Important Points

• In everyday life, we rarely see objects moving "forever" (like in option 3) because invisible forces such as gravity, friction, and air resistance are almost always present on Earth.

• The concept of inertia was crucial in transitioning from Aristotelian physics (which believed a force was needed to keep something moving) to Classical Mechanics (which recognizes that a force is only needed to change motion).

• In space (a vacuum), the effects of inertia are much more visible because the opposing force of friction is absent, allowing satellites and celestial bodies to maintain their paths for vast periods.

Q13. Answer: (d) The shape and size of cells are related to the specific function they perform.

The correct answer is The shape and size of cells are related to the specific function they perform..

Key Points

• The shape and size of cells are not uniform; they exhibit significant diversity depending on the biological role and physiological requirements of the organism. Cells are structured to maximize their efficiency in performing specific functions. Hence, statement 4 is correct.

• While plants and animals share some basic cellular components, their shape and size are not identical. Plant cells typically have a fixed, rectangular shape due to the cell wall, whereas animal cells are often irregular or round and lack a cell wall. Hence, statement 1 is incorrect.

• The morphology of a cell is determined by genetic factors and functional needs rather than being solely dependent on the availability of water. Although turgor pressure (water content) affects cell volume, it is not the only deciding factor for shape and size. Hence, statement 2 is incorrect.

• The shape and size of cells do not remain constant; they vary across different tissues and species. For instance, a nerve cell is drastically different from a skin cell in the same organism, and unicellular organisms like Amoeba can even change their shape constantly. Hence, statement 3 is incorrect.

• Specific examples of functional adaptation include human nerve cells (neurons), which are long and branched to transmit electrical impulses over long distances, and Red Blood Cells (RBCs), which are biconcave to increase surface area for oxygen transport.

Additional Information

• Cell Size Variability:

• The smallest cell known is Mycoplasma (a type of bacteria), measuring approximately 0.1 to 0.5 micrometers.

• The largest isolated single cell is the egg of an ostrich, which can measure approximately 170 mm x 130 mm.

• In the human body, the smallest cell is generally considered the sperm cell, while the largest cell is the ovum (egg cell). The longest cell is the nerve cell.

• Cell Shape Types:

• Cells can be spherical, spindle-shaped, elongated, cuboidal, or columnar.

• White Blood Cells (WBCs) in humans are amoeboid, meaning they can change shape to squeeze through capillary walls and engulf pathogens.

• Guard cells in plant stomata are kidney-shaped or bean-shaped to regulate the opening and closing of pores for gas exchange.

Important Points

• Discovery of the Cell: The cell was first discovered and named by Robert Hooke in 1665 using a primitive microscope to observe cork slices.

• Cell Theory: Proposed by Matthias Schleiden and Theodor Schwann in 1838-39, it states that all living things are composed of cells. Rudolf Virchow later added in 1855 that all cells arise from pre-existing cells (Omnis cellula-e cellula).

• Functional Correlation: The surface area to volume ratio is a critical factor limiting cell size. A smaller cell has a larger surface area relative to its volume, allowing for faster diffusion of nutrients and waste.

Q14. Answer: (c) Hybridisation

The correct answer is Hybridisation.

Key Points

• Hybridisation is a traditional method of crop variety improvement that involves the crossing of two or more plants with different genotypes to produce a new variety.

• The goal of this process is to combine desirable phenotypic traits—such as high yield, disease resistance, and nutritional quality—found in different parent plants into a single hybrid progeny.

• This method can be categorized based on the relationship between parents: Intervarietal (between two different varieties), Interspecific (between two different species of the same genus), and Intergeneric (between two different genera).

• The mechanical process of hybridisation involves several critical steps: selection of parents, emasculation (the removal of stamens to prevent self-pollination), bagging to prevent contamination, and artificial cross-pollination.

• By creating new genetic combinations, hybridisation has been a cornerstone of the Green Revolution, leading to the development of high-yielding varieties (HYV) of crops like wheat and rice. Hence, the correct answer is Hybridisation.

Additional Information

• Tissue Culture:

• This is an in vitro technique where cells, tissues, or organs are grown in a synthetic nutrient medium under aseptic conditions.

• It allows for the rapid cloning of plants, known as micropropagation, and is used to produce disease-free plants from meristems.

• Genetic Engineering:

• This modern biotechnology involves the direct manipulation of an organism's DNA to introduce a specific foreign gene (transgene).

• It results in Genetically Modified Organisms (GMOs), such as Bt Cotton, which possesses insecticidal properties derived from the bacterium Bacillus thuringiensis.

• Mutation Breeding:

• This method utilizes physical mutagens (like gamma rays or X-rays) or chemical mutagens to induce sudden, heritable changes in the plant's genetic sequence.

• It is used to create genetic variation when the desired trait is not available in the existing germplasm of the crop.

Important Points

• Selection: Before crossing, breeders perform mass selection or pure-line selection to ensure the parental plants are of the highest quality and possess the specific traits required for the improvement program.

• Heterosis: Also known as hybrid vigor, this is the phenomenon where the hybrid offspring exhibits superior biological functions (like faster growth or higher yield) compared to either of its parents.

• Objectives of Crop Improvement: Scientists focus on biotic resistance (against pests and pathogens), abiotic resistance (against drought, salinity, and heat), and shorter maturity duration to allow farmers to grow multiple crops in a year.

Q15. Answer: (c) 10 Ω

p-end=""57"" data-start=""0"">The correct answer is 10 Ω.

Key Points

• In an electrical circuit, when resistors are connected series, they are arranged in a single line or a daisy-chain fashion, meaning there is only one path for the current to flow through each component.

• The Equivalent Resistance (R_(eq)) or total resistance of a series combination is calculated by finding the arithmetic sum of the individual resistances.

• The mathematical formula used for this calculation is R_(total) = R1 + R2 + R3 + ... + R_n.

• Applying the formula to the given problem where the resistors are 2 Ω, 3 Ω, and 5 Ω:

• R_(total) = 2 Ω + 3 Ω + 5 Ω.

• R_(total) = 10 Ω.

• This indicates that the combined effect of these three resistors in series is equivalent to a single resistor of 10 Ω.

Additional Information

• Current in Series Circuits:

• The Electric Current (I) remains constant throughout a series circuit. Since there is only one path, the same number of electrons must pass through every point in the circuit per unit time.

• Voltage Distribution:

• According to Ohm’s Law (V = IR), the Potential Difference (Voltage) across each resistor is proportional to its resistance. The sum of the individual voltages equals the total source voltage: V_(total) = V1 + V2 + V3.

• Parallel Resistors:

• In a Parallel Connection, resistors are connected across the same two nodes. The Total Resistance (R_p) is found using the reciprocal formula: 1/R_p = 1/R1 + 1/R2 + 1/R3. For the given values, the parallel resistance would be approximately 0.967 Ω, which is much lower than the series total.

• Applications and Examples:

• Series circuits are often found in Voltage Dividers and simple Christmas tree lights (older versions), where if one bulb burns out, the entire string goes dark because the circuit is broken.

Important Points

• Resistance Characteristics:

• In any Series Combination, the total resistance is always greater than the largest individual resistance in the circuit. Here, 10 Ω is greater than the largest resistor of 5 Ω.

• The SI Unit of resistance is the Ohm (Ω), named after the physicist Georg Simon Ohm who published his work on the relationship between voltage, current, and resistance in 1827.

• Impact of Adding Resistors:

• Adding more resistors in series increases the Total Impedance of the circuit, which subsequently decreases the total current flowing from the power source, assuming the voltage remains constant.

Q16. Answer: (b) Moves from the principal focus (F) towards the pole (P)

The correct answer is Moves from the principal focus (F) towards the pole (P).

Key Points

• A convex mirror is a spherical mirror whose reflecting surface is curved outwards. It is also known as a diverging mirror because it diverges light rays after reflection.

• When an object is placed at infinity, the rays of light are parallel to the principal axis. These rays appear to diverge from the principal focus (F) after reflection. Therefore, the image is formed at focus (F) behind the mirror and is virtual, erect, and highly diminished.

• As the object is moved from infinity towards the pole (P) of the mirror, the virtual image shifts its position from the principal focus (F) toward the pole (P).

• During this transition, the size of the image gradually increases, although it always remains smaller than the object (diminished). Hence, the statement that the image moves from the principal focus (F) towards the pole (P) is correct.

• The image formed by a convex mirror is always situated between the pole (P) and the focus (F), regardless of the object's

position (unless the object is at infinity).

Additional Information

• Image Characteristics: For all positions of an object in front of a convex mirror, the image formed is always virtual, erect, and diminished. This makes these mirrors extremely useful for specific applications where a wide field of view is required.

• Mirror Formula: The relationship between object distance (u), image distance (v), and focal length (f) is given by 1/v + 1/u = 1/f. In a convex mirror, the focal length (f) and image distance (v) are always considered positive according to the Cartesian sign convention, while the object distance (u) is negative.

• Magnification: The linear magnification (m) is defined as the ratio of the height of the image to the height of the object (m = h'/h = -v/u). For a convex mirror, the value of m is always positive and less than 1, indicating a virtual, erect, and diminished image.

• Applications:

• Rear-view mirrors: They are used in vehicles because they provide an erect image and have a wider field of view as they are curved outwards.

• Security Mirrors: Used in shops and ATM centers to monitor a large area.

• Road Safety: Installed at sharp turns or blind corners to allow drivers to see oncoming traffic from the other side.

Important Points

• Unlike a concave mirror, which can form both real and virtual images depending on the object's position, a convex mirror can never form a real image of a real object.

• The focal length of a spherical mirror is exactly half of its radius of curvature (R), expressed as f = R/2.

• As the object distance u decreases (moves closer to the mirror), the image distance v also decreases (moves closer to the mirror surface), but v can never exceed the value of f when the object is real.

Q17. Answer: (c) The cube will float partially submerged, displacing water equal to its weight.

The correct answer is The cube will float partially submerged, displacing water equal to its weight.

Key Points

• Archimedes' Principle states that any object, totally or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object.

• A solid cube of wood has a density less than that of water (which is 1000 kg/m³ or 1 g/cm³). Because its density is lower, the upward buoyant force will balance its weight before it is fully submerged.

• Statement 1: The cube will completely sink to the bottom. This occurs only if the density of the object is greater than the density of the fluid. Since wood is less dense than water, this is impossible. Hence, statement 1 is incorrect.

• Statement 2: The cube will float with its entire volume above the water surface. For a buoyant force to exist, some volume of fluid must be displaced. An object cannot float "on top" of the water without any part of it being inside the water. Hence, statement 2 is incorrect.

• Statement 3: The cube will float partially submerged, displacing water equal to its weight. According to the Law of Flotation, a floating body displaces a weight of liquid exactly equal to its own weight. Because the wood is less dense than water, the volume of water required to match the wood's weight is less than the total volume of the cube. Hence, statement 3 is correct.

• Statement 4: The cube will remain suspended in the middle of water. This phenomenon, known as neutral buoyancy, occurs only when the density of the object is exactly equal to the density of the fluid. Hence, statement 4 is incorrect.

Additional Information

• Density and Floating:

• If the density of the object is less than the fluid, it floats.

• If the density of the object is more than the fluid, it sinks.

• If the densities are equal, the object floats fully submerged at any depth (suspended).

• Relative Density (Specific Gravity):

• This is the ratio of the density of a substance to the density of water at 4°C.

• Wood typically has a relative density ranging from 0.3 to 0.9. If a piece of wood has a relative density of 0.7, then 70% of its volume will be submerged under water while 30% remains above the surface.

• Displacement:

• The term displacement refers to the actual volume or weight of the fluid that is pushed aside by the object. For ships made of steel (which is denser than water), the shape is designed to displace a weight of water equal to the ship's weight before the water level reaches the top of the hull.

Important Points

• Buoyant Force (Upthrust): It is the upward force exerted by a fluid that opposes the weight of an immersed object. It is calculated as Fb = V × ρ × g, where V is the submerged volume, ρ is fluid density, and g is acceleration due to gravity.

• Center of Buoyancy: For a floating body to be in equilibrium, the center of gravity and the center of buoyancy must lie on the

same vertical line.

• Apparent Weight: When an object is in a fluid, its apparent weight is equal to its true weight minus the buoyant force. For a floating object, the apparent weight is zero because the buoyant force perfectly balances the weight.

• Iceberg Example: Since the density of ice is approximately 917 kg/m³ and seawater is about 1025 kg/m³, about 90% of an iceberg stays submerged, illustrating the high displacement needed to balance its mass.

Q18. Answer: (c) they are very unreactive

The correct answer is they are very unreactive.

Key Points

• The reactivity series (or activity series) is a list of metals arranged in descending order of their chemical reactivity. Metals at the bottom are the least likely to lose electrons and form compounds.

• Metals like Gold (Au), Silver (Ag), and Platinum (Pt) are located at the very bottom of this series. Their chemical stability means they do not easily react with atmospheric gases or moisture.

• Statement 1: Metals low in the activity series do not react vigorously with acids; in fact, Gold and Platinum are so stable they only dissolve in a specific mixture called Aqua Regia. Hence, statement 1 is incorrect.

• Statement 2: Highly reactive metals (like Sodium or Potassium) react violently with oxygen and water, whereas metals like Gold remain untarnished and pure over thousands of years. Hence, statement 2 is incorrect.

• Statement 3: These metals are very unreactive (chemically inert), which allows them to exist in their elementary form or native state within the earth's crust rather than as oxides or sulfides. Hence, statement 3 is correct.

• Statement 4: The melting point of a metal is a physical property that does not dictate its chemical occurrence in nature. For instance, Gold has a high melting point of 1,064°C. Hence, statement 4 is incorrect.

Additional Information

• Classification of Metals by Reactivity:

• High Reactivity: Metals like Potassium (K), Sodium (Na), and Calcium (Ca) are so reactive they are never found free in nature. They are extracted using electrolysis of their molten chlorides or oxides.

• Medium Reactivity: Metals like Zinc (Zn), Iron (Fe), and Lead (Pb) are found in the earth's crust mainly as oxides, sulfides, or carbonates. They are typically extracted via reduction with Carbon.

• Low Reactivity: Metals like Gold and Platinum are found in the native state. Copper (Cu) and Silver (Ag) are also found in the free state but can occasionally occur as sulfide or oxide ores.

• Noble Metals: These are metals that are resistant to corrosion and oxidation in moist air. Gold is the most prominent example, often used in jewelry and electronics because it does not corrode or react with most chemicals.

• Extraction: Because gold and silver are found in their metallic form, the extraction process often involves physical separation methods like hydraulic washing or chemical leaching (cyanidation) to separate the pure metal from the surrounding gangue (earthy impurities).

Important Points

• Standard Electrode Potential: In scientific terms, metals low in the activity series have positive reduction potentials, meaning they are difficult to oxidize (lose electrons).

• Occurrence: Gold is typically found in alluvial deposits (placer gold) or in quartz veins. It has been mined for over 5,000 years due to its ease of identification in its pure, yellow metallic form.

• Silver: Although found free, silver is slightly more reactive than gold and may develop a black coating of Silver Sulfide (Ag2S) when exposed to sulfur compounds in the air (tarnishing).

Q19. Answer: (a) Silver sulphide

The correct answer is Silver sulphide.

Key Points

• The dark or black layer that develops on Silver articles when exposed to air for a long time is Silver sulphide.

• This chemical process is specifically known as Tarnishing. It occurs because Silver reacts with Hydrogen Sulphide (H2S) gas present in the Atmosphere.

• The chemical formula for the black coating formed is Ag2S. Unlike the corrosion of iron, Silver sulphide is relatively stable and forms a thin film that protects the underlying metal from further deep Corrosion, although it ruins the luster.

• The reaction can be summarized as: Silver (Ag) reacting with Sulphur compounds and Oxygen to produce Silver sulphide and water/hydrogen.

• This layer is highly insoluble in most solvents and requires specific chemical treatments, such as Electrochemical reduction or Acidic cleaning, to be removed and restore the metal's shine.

Additional Information

• Iron oxide:

• Commonly known as Rust, it forms when Iron reacts with Oxygen and Moisture (water) in the air.

• Its chemical formula is typically represented as Fe2O3.xH2O (Hydrated Iron III Oxide).

• Unlike silver tarnishing, Rust is flaky and porous, which allows the Corrosion process to continue until the metal is completely eaten away.

• Copper oxide:

• When Copper is exposed to the atmosphere, it initially reacts with oxygen to form Copper (I) oxide or Copper (II) oxide, which are reddish or black.

• Over a longer period, Copper reacts with Carbon dioxide and moisture to form a green coating called Patina or basic Copper carbonate.

• This Green layer is famously seen on the Statue of Liberty.

• Zinc oxide:

• Zinc reacts with oxygen to form Zinc oxide (ZnO), which is usually a white or greyish-white powder.

• This layer is very effective at preventing further Oxidation, which is why Zinc is widely used in the process of Galvanization to protect Steel and Iron.

Important Points

• Factors affecting Corrosion: The rate of formation of Silver sulphide increases significantly in areas with high Industrial pollution, as the concentration of Sulphur dioxide and Hydrogen sulphide is higher.

• Prevention: Silver articles are often kept in Acid-free tissue paper or stored with Anti-tarnish strips that absorb Sulphur gases from the surrounding air to prevent the formation of the dark layer.

• Cleaning: A common household method to remove Silver sulphide is placing the silver item in a bowl lined with Aluminum foil containing hot water and Baking soda; the sulphur atoms transfer from the Silver to the Aluminum, restoring the Silver.

• Noble Metals: While Silver tarnishes, other noble metals like Gold and Platinum do not react easily with Atmospheric sulphur or oxygen, which is why they do not develop such layers under normal conditions.

Q20. Answer: (d) The Moon has no atmosphere.

The correct answer is The Moon has no atmosphere.

Key Points

• Sound waves are mechanical waves that require a material medium such as solid, liquid, or gas to propagate from one point to another.

• On the Moon, there is no atmosphere, which means the space is essentially a vacuum. In a vacuum, there are no air molecules or particles to carry vibrations.

• Sound is produced by vibrating objects, and these vibrations must be transmitted through a medium by the collision of particles. Since there are no particles on the Moon to collide and pass on the energy, sound cannot travel. Hence, the reason for not being able to hear sound on the Moon is that it has no atmosphere.

• Even if a massive explosion or a loud noise occurs on the lunar surface, an observer would not hear anything because there is no gaseous medium to facilitate the movement of longitudinal waves.

• The absence of sound is a characteristic of the lunar environment that necessitates specialized equipment for communication between astronauts.

Additional Information

• Nature of Sound Waves:

• Sound waves are longitudinal waves where the particles of the medium move parallel to the direction of the wave's propagation.

• These waves consist of compressions (high-pressure regions) and rarefactions (low-pressure regions).

• Communication in Space:

• Since sound cannot travel in a vacuum, astronauts use radio waves for communication.

• Radio waves are electromagnetic waves, which do not require a material medium and can travel through the vacuum of space at the speed of light.

• Speed of Sound:

• The speed of sound varies depending on the medium. It is approximately 343 meters per second in dry air at 20°C.

• Sound travels faster in liquids (about 1,480 m/s in water) and fastest in solids (about 5,000 m/s in steel) due to the closer proximity of atoms.

• Lunar Conditions:

• While the Moon has craters and experiences extreme temperature variations (ranging from -173°C at night to 127°C during the day), these factors do not directly inhibit sound; only the lack of air does.

• The Moon's gravity is about 1/6th of Earth's gravity, which is too weak to retain a substantial atmosphere.

Important Points

• Vacuum Properties: A vacuum is a space devoid of matter. The outer space between celestial bodies is a near-perfect vacuum, which prevents the transmission of acoustic energy.

• Audible Range: For humans, the audible frequency range is typically between 20 Hz and 20,000 Hz. On the Moon, even if a source produces these frequencies, they cannot reach the ear.

• Scientific Exploration: During the Apollo missions (such as Apollo 11 in 1969), it was practically demonstrated that voice communication was only possible through electronic headsets converting sound into radio signals.

Q21. Answer: (d) Christmas pudding

The correct answer is Christmas pudding.

Key Points

• J.J. Thomson proposed his model of an atom in 1904, shortly after the discovery of the electron.

• Thomson's model described the atom as a sphere of positive charge with negatively charged electrons embedded in it.

• To help visualize this, he used the analogy of a Christmas pudding, where the positive charge is like the pudding (the dough) and the electrons are like the raisins or dry fruits scattered throughout it.

• Another common comparison used by Thomson was a watermelon; the positive charge represents the red edible part, while the electrons are represented by the seeds embedded within the fruit.

• The most significant feature of this model was the proposal that the positive and negative charges are equal in magnitude, making the atom as a whole electrically neutral.

Additional Information

• Discovery of the Electron: J.J. Thomson discovered the electron in 1897 through his experiments with cathode ray tubes. This discovery proved that atoms were not indivisible, contradicting Dalton's atomic theory.

• Rutherford's Model: In 1911, Ernest Rutherford proposed the Planetary Model or Solar System analogy. He suggested that the atom has a dense, positive nucleus at its center, with electrons revolving around it like planets around the Sun.

• Bohr's Model: Niels Bohr refined the atomic structure in 1913 by introducing the concept of quantized energy levels, where electrons move in fixed orbits without radiating energy.

• The Nobel Prize: Sir Joseph John Thomson was awarded the Nobel Prize in Physics in 1906 for his theoretical and experimental investigations on the conduction of electricity by gases.

Important Points

• Shortcomings: Although Thomson's model was a breakthrough, it could not explain the results of the alpha-particle scattering experiment conducted by Ernest Rutherford in 1911.

• The gold foil experiment showed that most of the alpha particles passed straight through the atom, implying that atoms are mostly empty space, which directly contradicted the "solid pudding" idea of Thomson.

• The Christmas pudding model is also widely known as the Plum Pudding Model in scientific literature.

• This model was the first to recognize that subatomic particles exist within the atom, paving the way for modern atomic physics.

Q22. Answer: (c) Binary fission

The correct answer is Binary fission.

Key Points

• Amoeba is a unicellular eukaryotic organism that primarily reproduces through an asexual method known as Binary fission.

• During Binary fission, the process begins with the division of the nucleus, which is technically termed karyokinesis. The genetic material is replicated and separated into two equal halves.

• Following nuclear division, the cytoplasm starts to constrict and eventually divides, a process known as cytokinesis.

• This results in the formation of two identical daughter cells from a single parent cell, ensuring the continuity of the species without the need for gametes. Hence, the correct answer is Binary fission.

• This method typically occurs under favorable environmental conditions where food and temperature are optimal for growth and survival.

Additional Information

• Fragmentation:

• This is a form of asexual reproduction where the body of a multicellular organism breaks into two or more fragments upon maturation.

• Each fragment subsequently grows into a complete, new individual. A classic example of this is Spirogyra (a green algae) and Planaria. Hence, statement 1 is incorrect.

• Budding:

• In this process, a small outgrowth or bud forms on the parent body due to repeated cell division at one specific site.

• The bud matures while staying attached to the parent and eventually detaches to become an independent organism. Common examples include Yeast (unicellular) and Hydra (multicellular). Hence, statement 2 is incorrect.

• Spore Formation:

• This method involves the production of specialized reproductive structures called spores, usually encased in a protective thick wall to survive unfavorable conditions.

• When these spores land on a suitable moist surface, they germinate and grow into new individuals. This is frequently seen in fungi like Rhizopus (bread mold) and Mucor, as well as in ferns and mosses. Hence, statement 4 is incorrect.

• Multiple Fission:

• While Amoeba usually undergoes binary fission, it can perform multiple fission during extreme or unfavorable conditions.

• In this state, the Amoeba withdraws its pseudopodia and secretes a hard three-layered cyst. Inside the cyst, the nucleus divides many times to produce many daughter nuclei, eventually releasing multiple pseudopodiospores when conditions improve.

Important Points

• Asexual Reproduction is characterized by the involvement of only one parent and the absence of gametic fusion, resulting in offspring that are genetically identical (clones) to the parent.

• Binary fission in Amoeba can take place in any plane because the organism does not have a fixed body shape, unlike Leishmania, which undergoes binary fission in a definite orientation (longitudinal) relative to its flagellum.

• The simplest organisms, such as bacteria and protozoa, utilize fission as their primary mode of multiplication, which allows for rapid population growth in a short time period.

Q23. Answer: (a) To create an effective barrier regulating permeability of substances

The correct answer is To create an effective barrier regulating permeability of substances.

Key Points

• Epithelial tissues are the covering or protective tissues in the animal body. They cover most organs and cavities within the body.

• The cells of epithelial tissue are tightly packed and form a continuous sheet. This structural arrangement ensures that there is almost no intercellular space between the cells.

• The primary reason for this tight packing is to act as a selective barrier. Since it forms the outermost layer of the body and lines internal organs, any substance entering or leaving the body must cross at least one layer of epithelium.

• The permeability of these epithelial cells is vital for regulating the exchange of materials between the body and the external environment, and between different internal compartments. Hence, the statement in option 1 is correct.

• All epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane, which provides structural support and further regulates filtration.

Additional Information

• Types of Epithelial Tissue:

• Simple Squamous Epithelium: Extremely thin and flat cells forming a delicate lining. Found in oesophagus and the lining of the mouth.

• Stratified Squamous Epithelium: Skin epithelial cells arranged in many layers to prevent wear and tear.

• Columnar Epithelium: Pillar-like cells found where absorption and secretion occur, such as the inner lining of the intestine.

• Cuboidal Epithelium: Cube-shaped cells that provide mechanical support. Found in kidney tubules and salivary gland ducts.

• Ciliated Epithelium: Columnar tissues with hair-like projections (cilia) that move mucus forward to clear it, found in the respiratory tract.

• Functions: Apart from acting as a barrier, they are involved in protection, secretion, absorption, and excretion.

• Avascularity: Epithelial tissues are avascular, meaning they lack their own blood supply. They rely on the diffusion of nutrients from the underlying connective tissue.

Important Points

• Rapid Blood Flow: This is a function associated with Connective Tissue (specifically Blood and Vascular system), not epithelium. Epithelial cells are too tightly packed to allow blood to flow through them directly. Hence, option 2 is incorrect.

• Movement of Muscles: This is the specialized function of Muscular Tissue, which contains contractile proteins like actin and myosin that contract and relax to cause movement. Hence, option 3 is incorrect.

• Transmission of Electrical Signals: This is the primary function of Nervous Tissue. Neurons are designed to receive and conduct impulses (electrical signals) from one part of the body to another. Hence, option 4 is incorrect.

• Cell Junctions: The "little space" between epithelial cells is maintained by specialized structures called tight junctions, adherens junctions, and desmosomes, which seal the cells together to prevent leakage.

Q24. Answer: (a) They revolve around the nucleus in fixed orbits.

The correct answer is They revolve around the nucleus in fixed orbits..

Key Points

• Electrons are subatomic particles that revolve around the central nucleus of an atom in specific circular paths known as orbits or shells. These orbits represent discrete energy levels. Hence, statement 1 is correct.

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• The nucleus at the center of the atom contains protons and neutrons, which are collectively called nucleons. Electrons are located in the extranuclear region outside the nucleus. Hence, statement 2 is incorrect.

• The mass of an electron is approximately 9.11 x 10^-31 kg, which is about 1/1836 times the mass of a proton or a hydrogen atom. Because it is so small, its mass is usually considered negligible. Hence, statement 3 is incorrect.

• Electrons carry a negative electric charge of magnitude 1.602 x 10^-19 Coulombs. In contrast, protons are positively charged. Hence, statement 4 is incorrect.

• Hence, the correct answer is They revolve around the nucleus in fixed orbits.

Additional Information

• Discovery of the Electron:

• The electron was discovered by Sir J.J. Thomson in 1897 during his experiments with cathode ray tubes.

• He observed that the rays were deflected by electric and magnetic fields, suggesting they consisted of negatively charged particles.

• Bohr's Model of an Atom:

• Proposed by Niels Bohr in 1913, this model refined the idea of electron orbits.

• He stated that electrons move in fixed circular orbits without radiating energy. These orbits are designated by letters K, L, M, N or principal quantum numbers n = 1, 2, 3, 4.

• Charge and Mass:

• The charge-to-mass ratio (e/m) was first calculated by J.J. Thomson.

• The precise negative charge of the electron was later determined by Robert Millikan through the Oil Drop Experiment in 1909.

• Valence Electrons:

• Electrons in the outermost shell are called valence electrons. They are responsible for the chemical properties and valency of an element.

• The maximum number of electrons that can be accommodated in a shell is given by the formula $2n^2$.

Important Points

• Atomic Neutrality: An atom is electrically neutral because the number of electrons (negative charge) is equal to the number of protons (positive charge) in the nucleus.

• Subatomic Mass: The atomic mass of an element is almost entirely due to the nucleus (protons + neutrons), as the electron mass is so tiny (0.0005485 amu).

• Quantum Nature: In modern Quantum Mechanics (developed by Schrödinger in 1926), electrons are described as existing in orbitals, which are regions of high probability rather than strict circular tracks.

Q25. Answer: (c) They do not form ions in solution.

The correct answer is They do not form ions in solution.

Key Points

• Electrical conductivity in a liquid medium depends entirely on the presence of mobile charged particles, specifically ions (cations and anions) or free electrons.

• Glucose (C6H12O6) and Alcohol (such as Ethanol, C2H5OH) are categorized as covalent compounds. In these molecules, atoms are held together by the sharing of electrons rather than the transfer of electrons.

• When Glucose or Alcohol is dissolved in water, the molecules do not dissociate or break apart into ions; they remain as neutral, intact molecules throughout the solution.

• Because there is a total absence of free ions to carry the electric current between the positive and negative electrodes, these solutions act as insulators. Hence, statement 3 is correct.

• The property of evaporating quickly (volatility) is related to intermolecular forces and vapor pressure, not to the ability to carry a charge in an aqueous state. Hence, statement 1 is incorrect.

• Substances that are acidic in nature (like Hydrochloric acid) conduct electricity because they release Hydrogen ions (H+) in water. Since Glucose and Alcohol do not release such ions, they are not acidic and do not conduct. Hence, statement 2 is incorrect.

• These substances are organic molecules composed of Carbon, Hydrogen, and Oxygen, which are non-metals. They do not possess the metallic lattice or free electrons found in metals. Hence, statement 4 is incorrect.

Additional Information

• Electrolytes vs. Non-electrolytes:

• Electrolytes are substances that produce ions when dissolved in a solvent (usually water) or when melted. Common examples include Sodium Chloride (NaCl), Sulfuric Acid (H2SO4), and Sodium Hydroxide (NaOH).

• Non-electrolytes are substances that do not provide ions in a solution. Examples include Glucose, Urea, and Sucrose. These solutions do not conduct electricity.

• The Role of Ions:

• In an electrolytic cell, the anions (negative ions) move toward the anode (+), and cations (positive ions) move toward the cathode (-). This movement of charges completes the electrical circuit.

• Without the formation of these ions, the flow of electric current through the liquid is physically impossible.

• Chemical Bonding:

• Most organic compounds involve covalent bonding. Unless these compounds have polar groups that can ionize (like the carboxyl group in Acetic Acid), they generally remain non-conductive.

• Glucose and Alcohol contain hydroxyl (-OH) groups, but unlike bases, these -OH groups are covalently bonded to carbon and do not dissociate as hydroxide ions (OH-) in water.

• Distilled Water:

• Distilled water itself is a very poor conductor of electricity because it is a covalent compound with negligible ionization. It only becomes conductive when salts, acids, or bases are added to provide the necessary ions.

Q26. Answer: (b) 15 km/hr

Shortcut Trick

When the distance is constant, the Average Speed = (2 × S1 × S2) ÷ (S1 + S2).

Average Speed = (2 × 9 × 45) ÷ (9 + 45)

Average Speed = 810 ÷ 54 = 15 km/hr.

Therefore The correct answer is 15 km/hr.

Alternate Method

Given:

Speed to school (S1) = 9 km/hr

Speed from school (S2) = 45 km/hr

Formula Used:

Average Speed = Total Distance ÷ Total Time

Calculations:

=> Let the distance between home and school be 45 km (LCM of 9 and 45).

=> Time taken going (T1) = 45 ÷ 9 = 5 hours

=> Time taken returning (T2) = 45 ÷ 45 = 1 hour

=> Total Distance = 45 + 45 = 90 km

=> Total Time = 5 + 1 = 6 hours

=> Average Speed = 90 ÷ 6 = 15 km/hr

Therefore The correct answer is 15 km/hr.

Additional Information

Average Speed (General Case)

It is the ratio of Total Distance traveled to the Total Time taken. Formula: V_(avg) = (d1 + d2 + ...) ÷ (t1 + t2 + ...)

Average Speed (Equal Time Intervals)

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

Relative Speed

For two objects moving in the same direction, relative speed is |S1 − S2|. For opposite directions, it is (S1 + S2).

Q27. Answer: (a) 4

Shortcut Trick

Identify the minimum difference between any two numbers: 32 − 28 = 4 and 28 − 24 = 4.

The HCF must be a factor of this difference (4).

Check if 4 divides 32, 28, and 24 completely → Yes.

Therefore The correct answer is 4.

Alternate Method

Given: Numbers are 32, 28, and 24.

Formula Used: Prime Factorization Method for finding Highest Common Factor (HCF).

=> Prime factors of 32 = 2 × 2 × 2 × 2 × 2 = 2^5

=> Prime factors of 28 = 2 × 2 × 7 = $2^2 \times 7$

=> Prime factors of 24 = 2 × 2 × 2 × 3 = $2^3 \times 3$

=> The HCF is the product of the lowest power of common prime factors.

=> Common prime factor is 2, and its lowest power is 2^2.

=> HCF = 2 × 2 = 4

Therefore The correct answer is 4.

Additional Information

HCF Properties

The HCF of two or more numbers is the greatest number that divides each of them exactly. It is also known as GCD (Greatest Common Divisor).

Relationship between HCF and LCM

For two numbers a and b: HCF(a, b) × LCM(a, b) = a × b.

Division Method

To find HCF of large numbers, divide the larger by the smaller until the remainder is zero; the last divisor is the HCF.

Q28. Answer: (c) 67

Shortcut Trick

To find the age of the teacher when the average age increases, use the formula:

Teacher age = Old Average + (New Total Strength × Increase in Average)

Teacher age = 27 + (40 × 1) = 27 + 40 = 67

Therefore The correct answer is 67 years.

Alternate Method

Given:

Number of students = 39

Initial average age = 27 years

Total members including teacher = 39 + 1 = 40

New average age = 28 years

Formula Used:

Total Sum = Average × Number of observations

Teacher age = (New Total Sum) − (Initial Total Sum)

Calculations:

=> Total age of 39 students = 39 × 27

=> Total age of 39 students = 1053 years

=> Total age including teacher = 40 × 28

=> Total age including teacher = 1120 years

=> Teacher age = 1120 − 1053

=> Teacher age = 67 years

Therefore The correct answer is 67 years.

Additional Information

Net Deviation Method

The sum of deviations of all observations from their average is always zero. If the average increases by 1 for 40 people, the extra value brought by the new member must be 40 × 1.

Weighted Average Formula

Average_(combined) = (n1A1 + n2A2) ÷ (n1 + n2), where n is the number of items and A is the average.

Replacement Rule

Age of new person = Age of replaced person + (Total count × Change in Average).

Q29. Answer: (c) 4 : 19

The solution is in Hindi. Read it online.

Q30. Answer: (a) 15

Shortcut Trick

For any regular polygon, the sum of an interior angle and its corresponding exterior angle is always 180°.

Exterior angle = 180° − 156° = 24°

Number of sides (n) = 360° ÷ Exterior angle

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n = 360 ÷ 24 = 15

Therefore The correct answer is 15 sides.

Alternate Method

Given:

Interior angle of a regular polygon = 156°

Formula Used:

Interior angle of a regular polygon = [(n − 2) × 180°] ÷ n

Where n = number of sides of the polygon.

Calculations:

=> 156 = [(n − 2) × 180] ÷ n

=> 156n = 180n − 360

=> 180n − 156n = 360

=> 24n = 360

Q31. Answer: (a) Decreases by 71.13 %

Shortcut Trick

Using the ratio method for successive changes:

Initial : Final ratio = (100 : 50) × (100 : 70) × (100 : 50) × (100 : 165)

=> Ratio = (2 : 1) × (10 : 7) × (2 : 1) × (20 : 33) = 800 : 231

=> Net decrease = (800 − 231) ÷ 800 × 100 = 569 ÷ 8 = 71.125%

Therefore The correct answer is Decreases by 71.13%.

Alternate Method

Given: Successive changes are −50%, −30%, −50%, and +65%.

Formula Used: Final Price = Initial Price × (1 + r1/100) × (1 + r2/100) ...

Let the original price of fuel be 100.

=> Price after 1st month = 100 × (1 − 0.50) = 50

=> Price after 2nd month = 50 × (1 − 0.30) = 35

=> Price after 3rd month = 35 × (1 − 0.50) = 17.5

=> Price after 4th month = 17.5 × (1 + 0.65) = 17.5 × 1.65 = 28.875

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

=> Percentage change = (100 − 28.875) ÷ 100 × 100 = 71.125%

Therefore The correct answer is Decreases by 71.13%.

Additional Information

Successive Percentage Change

For two changes a% and b%, effective change = a + b + (ab/100). This can be extended to multiple changes.

Ratio Method for Percentage

Express each percentage change as a fraction (e.g., 50% decrease = 1/2). Final Value = Initial Value × (Product of multipliers).

Base Value Selection

Taking 100 as the initial base simplifies percentage calculations as the absolute change directly equals the percentage change.

Q32. Answer: (c) 91125

Shortcut Trick

The unit digit of the edge length 45 is 5.

The Volume of a cube is (Edge)³, so its unit digit will be 5 × 5 × 5 = 125, which ends in 5.

Among the given options, only 91125 ends with the digit 5.

Therefore The correct answer is 91125 m³.

Alternate Method

Given:

Edge length of the cube (a) = 45 m

Formula Used:

Volume of a cube = a³ (where a is the edge of the cube)

Calculations:

=> Volume = 45^3

=> Volume = 45 × 45 × 45

=> Volume = 2025 × 45

=> Volume = 91125 m^3

Therefore The correct answer is 91125 m^3.

Additional Information

Total Surface Area of a Cube

The total area of all six faces of the cube is given by $6a^2$.

Diagonal of a Cube

The longest distance between two opposite vertices is calculated as $a\sqrt{3}$.

Lateral Surface Area

The area of the four side faces (excluding top and bottom) is $4a^2$.

Q33. Answer: (d) 58800

Shortcut Trick

Let the number be N.

Given: 20% × 10% × (3/4) × N = 882

(1/5) × (1/10) × (3/4) × N = 882

3N / 200 = 882

N = (882 × 200) / 3 = 294 × 200 = 58800

Therefore The correct answer is 58800.

Alternate Method

Given: 20% of 10% of 3/4 of a number = 882

=> Let the number be x.

=> (20/100) × (10/100) × (3/4) × x = 882

=> (1/5) × (1/10) × (3/4) × x = 882

=> (3/200) × x = 882

=> x = (882 × 200) ÷ 3

=> x = 294 × 200

=> x = 58800

Therefore The correct answer is 58800.

Additional Information

Percentage to Fraction Conversion

To simplify calculations, convert percentages to fractions: 20% = 1/5 and 10% = 1/10.

Successive Percentage

When multiple percentages are applied to a number, they are multiplied together as factors: x × a% × b%.

Base Change Rule

If a number is increased or decreased, the new base for the next percentage calculation is the resulting value from the previous step.

Q34. Answer: (d) Rs. 802

Shortcut Trick

Total amount to be divided after deductions = 2037 − (23 + 42 + 52) = 2037 − 117 = Rs. 1920.

Ratio of remaining shares = 14 : 19 : 15. Sum of ratios = 14 + 19 + 15 = 48 units.

48 units = Rs. 1920 => 1 unit = Rs. 40.

Tina remaining share = 19 units × 40 = Rs. 760.

Tina actual share = Rs. 760 + 42 = Rs. 802.

Therefore The correct answer is Rs. 802.

Alternate Method

Given: Total amount = Rs. 2,037. Deductions = Rs. 23, Rs. 42, Rs. 52. Ratio = 14:19:15.

Formula: Actual Share = (Ratio Share × Remaining Total / Sum of Ratios) + Deduction

=> Total Deduction = 23 + 42 + 52 = Rs. 117

=> Remaining Amount = 2037 − 117 = Rs. 1920

=> Let shares be 14x, 19x, and 15x.

=> 14x + 19x + 15x = 1920

=> 48x = 1920 => x = 40

=> Tina remaining share = 19 × 40 = Rs. 760

=> Tina actual share = 760 + 42 = Rs. 802

Therefore The correct answer is Rs. 802.

Additional Information

Ratio and Proportion

Ratio is a comparison of two quantities of the same kind. If a sum S is divided in ratio a:b:c, the shares are [a/(a+b+c)]×S, [b/(a+b+c)]×S, and [c/(a+b+c)]×S respectively.

Inverse Variation

When two quantities are such that an increase in one leads to a decrease in the other, they are in inverse proportion (x × y = k).

Q35. Answer: (d) 313/8

Shortcut Trick

(1/3)^(-2) = 9 and (1/2)^(-3) = 8

{9 − 8} ÷ (1/4)^(-2) = 1 ÷ 16 = 1/16

(-3/2)^4 × (5/3)^4 = [(−5/2)]^4 = 625/16

Total = 1/16 + 625/16 = 626/16

Therefore Answer = 313/8

Alternate Method

Given:

{ (1/3)^(-2) − (1/2)^(-3) } ÷ (1/4)^(-2) + { (−3/2)^4 × (5/3)^4 }

Formula Used:

$a^{(-n)} = 1/a^n$, $(a/b)^n \times (c/d)^n = [(ac)/(bd)]^n$

Calculation:

{ (1/3)-2 − (1/2)-3 } ÷ (1/4)-2 + { (−3/2)4 × (5/3)4 }

=> $(3^2 - 2^3) \div 4^2 + [(-3/2 \times 5/3)^4]$

=> (9 − 8) ÷ 16 + (−5/2)^4

=> 1 ÷ 16 + 625/16

=> 626/16

=> 313/8

Therefore The correct answer is 313/8.

Additional Information

Negative Powers

$a^{(-n)} = 1/a^n$

Power Multiplication

$(a/b)^n \times (c/d)^n = [(ac)/(bd)]^n$

Even Power

Negative base becomes positive when power is even

Q36. Answer: (a) Rs. 1995

Shortcut Trick

Loss of 5% means SP1 is 95% of CP.

Gain of 5% means SP2 must be 105% of CP.

Using the unitary method: 95% => Rs. 1805.

1% => 1805 ÷ 95 = Rs. 19.

105% => 19 × 105 = Rs. 1995.

Therefore The correct answer is Rs. 1995.

Alternate Method

Given: Selling Price (SP1) = Rs. 1805, Loss% = 5%, Required Gain% = 5%.

Formulas: CP = [SP × 100] ÷ [100 − Loss%], SP = [CP × (100 + Gain%)] ÷ 100.

=> First, find the Cost Price (CP): CP = [1805 × 100] ÷ (100 − 5) = [1805 × 100] ÷ 95.

=> CP = 19 × 100 = Rs. 1900.

=> Now, find the New Selling Price (SP2) for 5% gain: SP2 = [1900 × (100 + 5)] ÷ 100.

=> SP2 = [1900 × 105] ÷ 100 = 19 × 105.

=> SP2 = Rs. 1995.

Therefore The correct answer is Rs. 1995.

Additional Information

Relation between SP and CP

When Profit occurs, SP = CP + Profit. When Loss occurs, SP = CP − Loss. CP is always considered 100% in percentage calculations.

Direct Ratio Method

If CP is constant, SP1 ÷ (100 − L%) = SP2 ÷ (100 + G%). This helps in solving questions involving change in profit/loss percentages quickly.

Q37. Answer: (d) 5 : 26

Shortcut Trick

The relationship between Cost Price (CP) and Marked Price (MP) is given by the ratio:

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

Given: Discount = 65% and Profit = 82%.

CP : MP = (100 − 65) : (100 + 82) = 35 : 182.

Dividing both sides by 7: 35 ÷ 7 : 182 ÷ 7 = 5 : 26.

Therefore The correct answer is 5 : 26.

Alternate Method

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

=> Let CP be 100.

=> SP = 100 + 82% of 100 = 182.

=> SP is also equal to MP × (100 − 65) ÷ 100 = MP × 35 ÷ 100.

=> 182 = MP × 35 ÷ 100 => MP = (182 × 100) ÷ 35 = 520.

=> Ratio CP : MP = 100 : 520 = 10 : 52 = 5 : 26.

Therefore The correct answer is 5 : 26.

Additional Information

Marked Price & Discount

The price at which an article is listed is the Marked Price (MP). Discount is always calculated on the MP.

Profit on Cost Price

Profit or loss is always calculated on the Cost Price (CP) unless otherwise stated.

Q38. Answer: (a) 40

Shortcut Trick

Ratio of Time = 1 : 1.5 = 2 : 3

Using weighted average: Average Speed = (S1×T1 + S2×T2) ÷ (T1 + T2)

52 = (70×2 + p×3) ÷ 5

260 = 140 + 3p => 3p = 120 => p = 40

Therefore The correct answer is 40 km/hr.

Alternate Method

Given: Speed 1 = 70 km/hr, Time 1 = 1 hr, Speed 2 = p km/hr, Time 2 = 1.5 hr, Avg Speed = 52 km/hr.

Formula Used: Total Distance = Average Speed × Total Time

=> Total Distance = (70 × 1) + (p × 1.5) = 70 + 1.5p

=> Total Time = 1 + 1.5 = 2.5 hours

=> Average Speed = Total Distance ÷ Total Time

=> 52 = (70 + 1.5p) ÷ 2.5

=> 52 × 2.5 = 70 + 1.5p

=> 130 = 70 + 1.5p

=> 1.5p = 60

=> p = 60 ÷ 1.5 = 40

Therefore The correct answer is 40 km/hr.

Additional Information

Average Speed Formula

Average Speed = Total Distance ÷ Total Time. It is not the simple arithmetic mean of speeds unless times are equal.

Harmonic Mean Case

If a car covers two equal distances at speeds x and y, then the average speed = 2xy ÷ (x + y).

Weighted Average Property

The average speed always lies between the minimum and maximum individual speeds of the journey segments.

Q39. Answer: (c) 1:3

Shortcut Trick

Total Work = LCM(12, 15, 20) = 60 units.

Efficiencies: (A+B) = 5, (B+C) = 4, (C+A) = 3.

2(A+B+C) = 5+4+3 = 12 → (A+B+C) = 6.

Efficiency of B = (A+B+C) − (C+A) = 6 − 3 = 3.

Efficiency of C = (A+B+C) − (A+B) = 6 − 5 = 1.

Ratio of Days = Inverse Ratio of Efficiency = 1 : 3.

Therefore The correct answer is 1:3.

Alternate Method

Given: (A+B) = 12 days, (B+C) = 15 days, (C+A) = 20 days.

Formula Used: Efficiency = Total Work ÷ Time; Time prop. to 1 ÷ Efficiency.

Person	Days	Total Work	Efficiency
A + B	12	60	5
B + C	15	4	
C + A	20	3	

=> 2(A + B + C) = 5 + 4 + 3 = 12

=> Efficiency of (A + B + C) = 6

=> Efficiency of B = (A + B + C) − (A + C) = 6 − 3 = 3 units/day

=> Efficiency of C = (A + B + C) − (A + B) = 6 − 5 = 1 unit/day

=> Days taken by B = 60 ÷ 3 = 20 days

=> Days taken by C = 60 ÷ 1 = 60 days

=> Ratio of days (B : C) = 20 : 60 = 1 : 3

Therefore The correct answer is 1:3.

Additional Information

Inverse Relation Rule

For a constant amount of work, the time taken is inversely proportional to the efficiency of the worker (Time1/Time2 = Efficiency2/Efficiency1).

Combined Work Formula

If individuals work in pairs, the total efficiency is half the sum of paired efficiencies: (A+B+C) = [(A+B) + (B+C) + (C+A)] ÷ 2.

LCM Method

Taking the Least Common Multiple of time periods as the total work simplifies calculation by avoiding fractions.

Q40. Answer: (d) Rs. 2,016

Shortcut Trick

Selling Price = Marked Price × (100 − Discount%) ÷ 100

SP = 2,400 × (100 − 16) ÷ 100

SP = 2,400 × (84 ÷ 100) = 24 × 84

SP = 2,016

Therefore The correct answer is Rs. 2,016.

Alternate Method

Given: Marked Price (MP) = Rs. 2,400, Discount Percentage = 16%.

Formulas: Discount = MP × (Discount% ÷ 100) | Selling Price (SP) = MP − Discount

=> Discount Amount = 2,400 × (16 ÷ 100)

=> Discount Amount = 24 × 16 = Rs. 384

=> Selling Price = 2,400 − 384

=> Selling Price = Rs. 2,016

Therefore The correct answer is Rs. 2,016.

Additional Information

Marked Price & Discount

The Marked Price is the price printed on the label. Discount is always calculated on the Marked Price unless otherwise specified.

Profit/Loss vs. Discount

While Discount is the reduction from the Marked Price, Profit or Loss is determined by the difference between the Selling Price and the Cost Price.

Q41. Answer: (c) 53

Shortcut Trick

For divisibility by 72, the number must be divisible by 8 and 9.

Check 8: Last three digits 47x must be divisible by 8 => x = 2.

Check 9: Sum of digits (8+3+y+5+4+7+2) = 29 + y must be divisible by 9 => y = 7.

Required value: $x^2 + y^2 = 2^2 + 7^2 = 4 + 49 = 53$.

Therefore The correct answer is 53.

Alternate Method

Given: Number 83y547x is divisible by 72.

Formula Used: Divisibility by 72 requires divisibility by 8 (co-prime factor 1) and 9 (co-prime factor 2).

Step 1: Divisibility by 8

=> The last three digits 47x must be divisible by 8.

=> 472 ÷ 8 = 59 (remainder 0).

=> x = 2.

Step 2: Divisibility by 9

=> The sum of digits 8 + 3 + y + 5 + 4 + 7 + 2 must be divisible by 9.

=> 29 + y must be divisible by 9.

=> The nearest multiple of 9 after 29 is 36.

=> 29 + y = 36 => y = 7.

Step 3: Final Calculation

=> Sum of squares = $x^2 + y^2$

=> $2^2 + 7^2 = 4 + 49 = 53$.

Therefore The correct answer is 53.

Additional Information

Divisibility Rule of 8

A number is divisible by 8 if the last three digits are divisible by 8 or are zeros.

Divisibility Rule of 9

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

Composite Divisibility

To check divisibility by a composite number like 72, break it into co-prime factors (8 and 9) and check for each.

Q42. Answer: (d) 134

Shortcut Trick

Net deviation of first 7 numbers from Average 92: (−62) + (−60) + (−46) + (−11) + (+18) + (−19) + (−72) = −252.

To maintain the overall average, the remaining 6 numbers must compensate for this loss.

Average compensation required = 252 ÷ 6 = +42.

Average of remaining numbers = 92 + 42 = 134.

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Therefore The correct answer is 134.

Alternate Method

Given: Total numbers = 13 | Average = 92 | First 7 numbers = 30, 32, 46, 81, 110, 73, 20.

Formula Used: Sum = Average × Number of terms | Average = Sum ÷ Number of terms.

=> Total sum of 13 numbers = 13 × 92 = 1196

=> Sum of first 7 numbers = 30 + 32 + 46 + 81 + 110 + 73 + 20 = 392

=> Sum of remaining 6 numbers = 1196 − 392 = 804

=> Average of remaining 6 numbers = 804 ÷ 6 = 134

Therefore The correct answer is 134.

Additional Information

Deviation Method for Averages

The sum of deviations of all observations from their mean is always zero. This is used to find missing values or averages of subgroups quickly.

Weighted Average Formula

If two groups have sizes n1, n2 and averages A1, A2, then Combined Average = (n1A1 + n2A2) ÷ (n1 + n2).

Effect of Change in Values

If every number in a set is increased or decreased by a constant k, the average of the set also increases or decreases by k.

Q43. Answer: (a) 116.67%

Shortcut Trick

Required percentage = (Value 1 ÷ Value 2) × 100

Value 1 = 1/30, Value 2 = 2/70 = 1/35

Percentage = (1/30 ÷ 1/35) × 100 = (35/30) × 100 = (7/6) × 100

7/6 × 100 = 1.1666... × 100 = 116.67%

Therefore The correct answer is 116.67%.

Alternate Method

Given: First fraction = 1/30, Second fraction = 2/70

Formula Used: Percentage = (Part/Whole) × 100

Calculations:

=> Let 1/30 be x% of 2/70.

=> 1/30 = (x/100) × (2/70)

=> 1/30 = (x/100) × (1/35)

=> x = (35/30) × 100

=> x = (7/6) × 100

=> x = 700/6 = 116.666...

=> Rounding off to two decimal places, x = 116.67

Therefore The correct answer is 116.67%.

Additional Information

Fraction to Percentage Conversion

To convert any fraction a/b to a percentage, multiply it by 100 and add the % symbol.

Reciprocal Fraction Values

1/6 is approximately 16.67%. Therefore, 7/6 can be calculated as 100% + 16.67% = 116.67%.

Rounding Off Rules

If the third decimal digit is 5 or greater, increase the second decimal digit by 1. Here, 116.666... becomes 116.67.

Q44. Answer: (a) 28

Shortcut Trick

Total days from 6 February 2023 to 20 April 2023 = 22 (Feb) + 31 (Mar) + 20 (Apr) = 73 days.

Time in years = 73 ÷ 365 = 1/5 year.

Interest for 1 year = 7% of Rs. 2,000 = Rs. 140.

Simple Interest for 1/5 year = 140 ÷ 5 = Rs. 28.

Therefore The correct answer is Rs. 28.

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Alternate Method
Given:
Principal (P) = Rs. 2,000
Rate (R) = 7% per annum
Time Calculation:
February (non-leap year) = 28 − 6 = 22 days
March = 31 days
April = 20 days
=> Total Days = 22 + 31 + 20 = 73 days
=> Time (T) = 73/365 year = 1/5 year
Formula Used:
Simple Interest (SI) = (P × R × T) ÷ 100
Calculations:
=> SI = (2000 × 7 × 1/5) ÷ 100
=> SI = (2000 × 7) ÷ (100 × 5)
=> SI = 14000 ÷ 500
=> SI = 140 ÷ 5
=> SI = Rs. 28
Therefore The correct answer is Rs. 28.
Additional Information
Simple Interest (SI) Formula
Interest remains constant every year and is calculated only on the principal amount: SI = (P × R × T) ÷ 100.
Day Calculation Rule
While calculating the number of days, usually the day of deposit is excluded and the day of withdrawal is included.
Standard Conversions
In interest problems, 73 days is exactly 1/5 of a year (365 ÷ 73 = 5), and 146 days is 2/5 of a year.
Leap Year Check
If the year is divisible by 4, it is a leap year (29 days in Feb), otherwise, it has 28 days.

Q45. Answer: (a) 3

Shortcut Trick
Combined Efficiency = (Total Work ÷ A) + (Total Work ÷ B) + (Total Work ÷ C)
Using LCM (2, 24, 8) = 24 as Total Work.
Combined Efficiency = 12 + 1 + 3 = 16 units/day.
Time for twice the work = (2 × 24) ÷ 16 = 48 ÷ 16 = 3 days.
Therefore The correct answer is 3 days.
Alternate Method
Given:
Time taken by A = 2 days
Time taken by B = 24 days
Time taken by C = 8 days

Person	Days	Total Work	Efficiency
A	2	24	12
B	24	1	
C	8	3	

Calculations:
=> Total Work (LCM of 2, 24, 8) = 24 units
=> Combined efficiency of A + B + C = 12 + 1 + 3 = 16 units/day
=> Total work to be done = 2 × 24 = 48 units
=> Time taken = 48 ÷ 16 = 3 days

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Therefore The correct answer is 3 days.

Additional Information

Total Work Formula

Total Work = Efficiency × Time. If work is doubled, the time taken at constant efficiency also doubles.

Combined Efficiency

When individuals work together, their individual efficiencies are added to find the net rate of work.

Work and Wages

Wages are generally distributed in the ratio of efficiency or the ratio of work done by each individual.

Q46. Answer: (c) Rs. 30

Shortcut Trick

Identify the symmetrical coefficients in the equations: 2R + 3B = 78 and 3R + 2B = 72.

Simply add both equations to find the combined sum: (2 + 3)R + (3 + 2)B = 78 + 72.

5 × (Red + Blue) = 150.

Divide the total sum by 5: 150 ÷ 5 = 30.

Therefore The correct answer is Rs. 30.

Alternate Method

Let the cost of one red pen be Rs. x and the cost of one blue pen be Rs. y.

Given:

=> 2x + 3y = 78 --- (Equation 1)

=> 3x + 2y = 72 --- (Equation 2)

Calculations:

Adding Equation 1 and Equation 2:

=> (2x + 3y) + (3x + 2y) = 78 + 72

=> 5x + 5y = 150

Taking 5 as a common factor:

=> 5(x + y) = 150

Dividing both sides by 5:

=> x + y = 150 ÷ 5

=> x + y = 30

Therefore The correct answer is Rs. 30.

Additional Information

Simultaneous Linear Equations

When equations are in the form ax + by = m and bx + ay = n, the quickest way to find (x + y) is to add them, and (x − y) is to subtract them.

Elimination Method

To find individual costs, multiply Equation 1 by 3 and Equation 2 by 2 to eliminate x, or use substitution once (x + y) is known.

Unitary Relationship

If nx + ny = K, then the cost of a single set (x + y) is always K ÷ n.

Q47. Answer: (b) 200

Shortcut Trick

Fourth proportion (x) = (3 × 16) ÷ 24 = 2.

Third proportion formula: $b^2/a = 20^2/A$.

Equating both: 2 = 400 ÷ A => A = 200.

Therefore The correct answer is 200.

Alternate Method

Given: Numbers for fourth proportion = 24, 3, 16; Numbers for third proportion = A, 20.

Formula: Fourth proportion (d) of a, b, c is d = (b × c)/a. Third proportion (c) of a, b is $c = b^2/a$.

=> Let the fourth proportion be x.

=> x = (3 × 16) ÷ 24

=> x = 48 ÷ 24 = 2

=> According to the question, Third proportion of A and 20 is also 2.

=> $2 = 20^2 \div A$

=> $2 = 400 \div A$

=> $A = 400 \div 2 = 200$

Therefore The correct answer is 200.

Additional Information

Mean Proportion

The mean proportion between two numbers a and b is given by $\sqrt{(a \times b)}$.

Continued Proportion

If a, b, c are in continued proportion, then $a/b = b/c$, which implies $b^2 = ac$.

Ratio & Proportion Basics

Product of extremes = Product of means. For a : b :: c : d, then $a \times d = b \times c$.

Q48. Answer: (c) 15.84 kg

Shortcut Trick

Mass = Density × Volume = $\rho \times \pi(R^2 - r^2)h$

Mass = $5 \times (22/7) \times (7^2 - 5^2) \times 42$

Mass = $5 \times 22 \times (49 - 25) \times 6 = 110 \times 24 \times 6 = 110 \times 144$

Mass = 15840 g = 15.84 kg

Therefore The correct answer is 15.84 kg.

Alternate Method

Given:

Outer radius (R) = 7 cm

Inner radius (r) = 5 cm

Length (h) = 42 cm

Density (ρ) = 5 g/cm³

Formula Used:

Volume of hollow cylinder (V) = $\pi(R^2 - r^2)h$

Mass = Volume × Density

Calculations:

=> Volume of metal (V) = $(22/7) \times (7^2 - 5^2) \times 42$

=> $V = (22/7) \times (49 - 25) \times 42$

=> $V = 22 \times 24 \times (42 \div 7)$

=> $V = 22 \times 24 \times 6 = 3168$ cm³

=> Mass = $3168 \times 5 = 15840$ g

=> Mass in kg = $15840 \div 1000 = 15.84$ kg

Therefore The correct answer is 15.84 kg.

Additional Information

Total Surface Area of Hollow Cylinder

The total surface area includes inner and outer curved areas plus the areas of the two rings: $2\pi h(R + r) + 2\pi(R^2 - r^2)$.

Curved Surface Area of Hollow Cylinder

The total curved surface area is the sum of the external and internal curved areas: $2\pi Rh + 2\pi rh = 2\pi h(R + r)$.

Density-Mass Relation

Density is the mass per unit volume. For uniform materials, Mass = Volume × Density. Units must be consistent (e.g., g/cm³ with cm³ results in grams).

Q49. Answer: (b) 4/5

Shortcut Trick

Use the standard Pythagorean triplet (3, 4, 5).

Since $\sin \theta = 3/5$ = Perpendicular/Hypotenuse, the Base must be 4.

Therefore $\cos \theta$ = Base/Hypotenuse = 4/5.

Therefore The correct answer is 4/5.

Alternate Method

Given: $\sin\theta = 3/5$

Formula Used: $\sin^2\theta + \cos^2\theta = 1$

$\Rightarrow \cos^2\theta = 1 - \sin^2\theta$

$\Rightarrow \cos^2\theta = 1 - (3/5)^2$

$\Rightarrow \cos^2\theta = 1 - 9/25$

$\Rightarrow \cos^2\theta = (25 - 9)/25 = 16/25$

$\Rightarrow \cos\theta = \sqrt{(16/25)} = 4/5$ (as θ is in the 1st quadrant, $\cos\theta$ is positive)

Therefore The correct answer is 4/5.

Additional Information

Trigonometric Identities

Fundamental identities include $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Quadrant Signs (ASTC Rule)

In the 1st quadrant, All ratios are positive. In the 2nd, only Sine/Cosec. In the 3rd, Tan/Cot. In the 4th, Cos/Sec.

Q50. Answer: (a) 128

Shortcut Trick

Identify terms: Let $a = 2x$ and $b = 3y$. Given $a + b = 8$ and $a^2 + b^2 = 32$.

Find the value of ab: $ab = [(a + b)^2 - (a^2 + b^2)] \div 2 = [64 - 32] \div 2 = 16$.

Apply sum of cubes formula: $a^3 + b^3 = (a + b)(a^2 + b^2 - ab)$.

Substitute the values: $8x^3 + 27y^3 = 8 \times (32 - 16) = 8 \times 16 = 128$.

Therefore The correct answer is 128.

Alternate Method

Given:

$2x + 3y = 8$

$4x^2 + 9y^2 = 32$

Formula Used:

$(a + b)^2 = a^2 + b^2 + 2ab$

$a^3 + b^3 = (a + b)^3 - 3ab(a + b)$

Calculations:

$\Rightarrow$ Let $a = 2x$ and $b = 3y$

$\Rightarrow (2x + 3y)^2 = (2x)^2 + (3y)^2 + 2(2x)(3y)$

$\Rightarrow (8)^2 = 32 + 2(6xy)$

$\Rightarrow 64 = 32 + 12xy$

$\Rightarrow 12xy = 64 - 32 = 32$

$\Rightarrow 6xy = 16$

$\Rightarrow$ Now, $8x^3 + 27y^3 = (2x + 3y)^3 - 3(2x)(3y)(2x + 3y)$

$\Rightarrow 8x^3 + 27y^3 = (8)^3 - 3(6xy)(8)$

$\Rightarrow 8x^3 + 27y^3 = 512 - 3(16)(8)$

$\Rightarrow 8x^3 + 27y^3 = 512 - 384$

$\Rightarrow 8x^3 + 27y^3 = 128$

Therefore The correct answer is 128.

Additional Information

Sum of Cubes Identity

The expression $a^3 + b^3$ can be factored as $(a + b)(a^2 - ab + b^2)$ or written as $(a + b)^3 - 3ab(a + b)$.

Difference of Cubes Identity

The expression $a^3 - b^3$ is calculated using $(a - b)(a^2 + ab + b^2)$ or $(a - b)^3 + 3ab(a - b)$.

Square of a Binomial

The identity $(a + b)^2 = a^2 + 2ab + b^2$ is essential for finding the product term ab when the sum and sum of squares are known.

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Q51. Answer: (a) US – ZS

Logic followed here is: (Positional value of the first letter of the 1st cluster) + 3 = (Positional value of the first letter of the 2nd cluster).

1) US - ZS →

2) AY - DY →

2) QO - TO →

4) SQ - VQ

Therefore, the letter-cluster pair 'US - ZS' does not belong to the group.

Hence, the correct answer is "Option 1".

Q52. Answer: (d) 17

Given:

Total people in the row = 54

Mohit sits 22^(nd) from the right end.

Charu sits 15^(th) from the left end.

Step 1:

Find Mohit’s position from the left end.

Formula:

Position from left = Total people − Position from right + 1

= 54 − 22 + 1

= 33

So, Mohit is 33^(rd) from the left end.

Step 2:

Charu is 15^(th) from the left end.

People between Mohit and Charu:

= 33 − 15 − 1

= 17

Therefore, 17 people sit between Mohit and Charu.

Hence, the correct answer is "Option 4".

Q53. Answer: (d) 8

Logic followed here is: The resultant is determined by identifying the highest and lowest numbers in the given set and then summing their respective third digits.

For

The highest number 473 →

Third digit of the highest number = 3

The lowest number 125 →

Third digit of the lowest number = 5

The pattern observed is: (Third digit of the highest number) + (Third digit of the lowest number).

Similarly, let's find the resultant:

Sum of third digits = 3 + 5 = 8

Therefore, the resultant is 8.

Hence, the correct answer is "Option 4".

Q54. Answer: (a) 30

Logic followed here is: The given sequence is a combination of two alternating series.

Therefore, the number that should come in place of the question mark is 30.

Hence, the correct answer is "Option 1".

Q55. Answer: (d) cd

Given:

‘some good questions’ is coded as ‘jm ik cd’

‘many good problems’ is coded as ‘cd rc gh’

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Common word analysis:

Therefore, “good” is coded as “cd”.

Hence, the correct answer is "Option 4".

Q56. Answer: (a) JWI

Logic followed here is:

The next term in the series is determined by adding 2 to the positional values of the first and second letters, and subtracting 1 from the positional value of the third letter of the previous term in the English alphabetical order.

For

Next term = JWI

Therefore, the term in place of the question mark (?) is JWI.

Hence, the correct answer is "Option 1".

Q57. Answer: (c) 7

Given:

Number = 3215674

Rule:

Add 1 to each odd digit.

Subtract 1 from each even digit.

Step 1: Form the new number

Original Digit	Operation	New Digit
3	3 + 1	4
2	2 − 1	1
1	1 + 1	2
5	5 + 1	6
6	6 − 1	5
7	7 + 1	8
4	4 − 1	3

New number formed = 4126583

Step 2: Find highest and lowest digits

Highest digit = 8

Lowest digit = 1

Difference = 8 − 1 = 7

Therefore, the required difference is 7.

Hence, the correct answer is "Option 3".

Q58. Answer: (a) Neither conclusion (I) nor (II) follows

Statements:

All bananas are grapes.

No banana is a cucumber.

Venn Diagram Logic:

Conclusions:

(I) Some cucumbers are grapes: Does not follows (There is no definite relation given between cucumbers and grapes.)

(II) All grapes are cucumbers: Does not follows (Only bananas are grapes is given. It does not mean all grapes are cucumbers.)

Therefore, neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 1".

Q59. Answer: (c) PS - NR

Logic followed here is: (First letter-cluster positional values) - 2 = (Second letter-cluster positional values).

For

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1) MQ - KO :
2) KO - IM :
3) PS - NR:
4) GK - EI :
Therefore, the letter-cluster pair PS - NR does not belong to the group as it subtracts 1 from the second letter instead of 2.
Hence, the correct answer is "Option 3".

Q60. Answer: (c) XHK : BEO

Logic followed here is: (+4, -3, +4) shift applied to the positional values of the letters.
For
HTU is coded as LQY →
PNC is coded as TKG →
Similarly, Option 3) XHK:
Therefore, the pair 'XHK : BEO' follows the same pattern.
Hence, the correct answer is "Option 3".

Q61. Answer: (b) 18 km to the South

Given:
Sunil starts from Point A.
1. Drives 64 km towards West
2. Takes a left turn and drives 60 km
3. Takes a left turn and drives 67 km
4. Takes a left turn and drives 78 km
5. Takes a final left turn and drives 3 km to reach Point P
Step-by-step movement:
Horizontal movement:
West = 64 + 3 = 67 km
East = 67 km
Horizontal displacement = 0
Vertical movement:
North = 78 km
South = 60 km
Net movement = 18 km North
So Point P is 18 km to the north of Point A.
To reach Point A again, Sunil must travel 18 km towards the South.
Hence, the correct answer is "Option 2".

Q62. Answer: (c) 9

Given:
‘VALE’ is coded as ‘3751’
‘ULVA’ is coded as ‘1397’
Therefore, the code for ‘U’ is 9.
Hence, the correct answer is "Option 3".

Q63. Answer: (b) Four

Given:
(Left) 4 1 9 7 8 4 8 5 9 4 6 5 2 3 7 4 2 5 7 6 3 2 4 5 1 3 (Right)
We need to find the even digits which are:
→ Immediately preceded by an even digit
→ Immediately followed by an odd digit
Required pattern: Even digit → Even digit → Odd digit
Checking the series:
(Left) 4 1 9 7 8 4 8 5 9 4 6 5 2 3 7 4 2 5 7 6 3 2 4 5 1 3 (Right)

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The even digits satisfying the condition are:

8 in (4 8 5)

6 in (4 6 5)

2 in (4 2 5)

4 in (2 4 5)

Total such even digits = 4

Hence, the correct answer is "Option 2".

Q64. Answer: (c) Three

Given:

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

Perfect square single-digit numbers are:

1, 4, 9

Checking the series:

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

Distinct perfect square numbers present in the series are:

1, 4, 9

Total perfect square numbers = 3

Hence, the correct answer is "Option 3".

Q65. Answer: (a) Brother's wife's brother

Decoding the symbols:

A is | Symbol | + | - | × | & | | --- | --- | --- | --- | | Meaning | son | brother | wife | father | to B	**Symbol**	•	•	×	&	**Meaning**	**son**	**brother**	**wife**	**father**
Symbol	•	•	×	&						
Meaning	son	brother	wife	father						

Expression:

T + O & R x N - M: T is the son of O. O is father of R. R is the wife of N. N is the brother of M.

Therefore, T is M’s brother’s wife’s brother.

Hence, the correct answer is "Option 1".

Q66. Answer: (a) WTX−BYC

The logic followed here is: (First Word Letter Position + 5) = Second Word Letter Position.

For AXB − FCG:

For IFJ − NKO:

Checking the Options, Option (1) WTX − BYC:

Therefore, the pair 'WTX − BYC' follows the same pattern.

Hence, the correct answer is "Option 1".

Q67. Answer: (c) Neither conclusion (I) nor (II) is true.

Statements:

Some Hammers are Screwdrivers.

No Screwdrivers are Wrenches.

All Wrenches are Pliers.

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Venn Diagram Logic:

Conclusions:

(I) Some Wrenches are Screwdrivers: Does not follows (Because no Screwdrivers are Wrenches.)

(II) Some Screwdrivers are Pliers: False(No direct relation is given between Screwdrivers and Pliers.)

Therefore, neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Neither conclusion (I) nor (II) follows".

Q68. Answer: (a) 896

Logic followed here is:

Each subsequent number in the series is obtained by adding the factorial of

Therefore, the number that will replace the question mark is 896.

Hence, the correct answer is "Option 1".

Q69. Answer: (d) (146, 302, 224)

Logic followed here is: The third number is the average of the first and second numbers.

(First number + Second number) ÷ 2 = Third number

For (106, 368, 237) →

Calculation:

(106 + 368) ÷ 2 = 474 ÷ 2 = 237

For (114, 336, 225) →

Calculation:

(114 + 336) ÷ 2 = 450 ÷ 2 = 225

The pattern observed is: (First number + Second number) ÷ 2 = Third number.

Similarly, let's check the options:

Option (4): (146, 302, 224)

Calculation:

(146 + 302) ÷ 2 = 448 ÷ 2 = 224

Therefore, the set that follows the same logic is (146, 302, 224).

Hence, the correct answer is "Option 4".

Q70. Answer: (d) VQSW

Logic followed here is.

Logic: Each letter in the first cluster is shifted forward by 7 positions in the English alphabetical order to obtain the corresponding letter in the related cluster.

For

KFHL is related to RMOS →

MHJN is related to TOQU →

The pattern observed is: (Positional value of each letter) + 7.

Similarly, let's find the relation for OJLP:

Therefore, the term related to 'OJLP' is VQSW.

Hence, the correct answer is "Option 4".

Q71. Answer: (d) 71st

Given:

Total students in the row = 97

Mr. Akte is 9^(th) from the right end.

Mr. Memi sits 18 places to the left of Mr. Akte.

Step 1:

Find Mr. Akte’s position from the left end.

Formula:

Position from left = Total students − Position from right + 1

= 97 − 9 + 1

= 89

So, Mr. Akte is 89^(th) from the left end.
Step 2:
Mr. Memi is 18 places to the left of Mr. Akte.
So,
89 − 18 = 71
Therefore, Mr. Memi is 71^(st) from the left end.
Hence, the correct answer is "Option 4".

Q72. Answer: (d) Two

Given:
Seven people A, B, C, D, E, F and G are sitting in a straight line facing north.
A sits fourth from the left end.
Only one person sits between A and B.
Only three people sit between C and B.
E sits third to the left of C.
D sits second to the right of G.
Find the number of people between A and F.
F is at position 1.
A is at position 4.
People between them are: B and E
Total people between A and F = 2
Therefore, the answer is Two.
Hence, the correct answer is "Option 4".

Q73. Answer: (d) Two

Given Series:
(Left) 4 1 7 9 2 2 7 9 9 9 4 7 7 8 9 1 8 6 2 1 2 2 8 (Right)
We need to find the even numbers which are:
→ Immediately preceded by an even number
→ Immediately followed by an odd number
Required pattern: Even – Even – Odd
Checking the series:
(Left) 4 1 7 9 2 2 7 9 9 9 4 7 7 8 9 1 8 6 2 1 2 2 8 (Right)
The valid even numbers are:
2 in (2 2 7)
2 in (6 2 1)
Total such even numbers = 2
Therefore, the answer is Two.
Hence, the correct answer is "Option 4".

Q74. Answer: (d) One

Given:
Six people G, H, I, Q, R and S are sitting in a straight line facing north.
Only three people sit between Q and I.
G sits to the immediate left of I.
No one sits to the right of S.
Only one person sits between S and G.
R sits to the immediate right of H.
Find the number of people between I and R.
R is at position 3.
I is at position 5.
Only G sits between them.
Total people between I and R = 1

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Therefore, the answer is One.

Hence, the correct answer is "Option 4".

Q75. Answer: (c) 42

Given Mapping:

Letter	Operation
P	×
Q	÷
R	−
S	•

Given Equation:

11 P 3 S (30 Q 5) P 2 R 15 S 6 P 2

Replace the letters with symbols:

=> 11 × 3 + (30 ÷ 5) × 2 − 15 + 6 × 2

=> 11 × 3 + 6 × 2 − 15 + 6 × 2

=> 33 + 12 − 15 + 12

=> 45 − 15 + 12

=> 57 - 15

=> 42

Hence, the correct answer is "Option 3".

Q76. Answer: (a) GCF 68

Logic followed here is:

The series follows a pattern where each cluster is formed by incrementing the alphabetical position of every letter by 1 and increasing the number part by 5.

Therefore, the cluster that will replace the question mark is GCF 68.

Hence, the correct answer is "Option 1".

Q77. Answer: (a) 92

Given Condition:

'+' and '−' are interchanged

'×' and '÷' are interchanged

Given Equation:

115 × 5 − 14 ÷ 6 + 15

After interchanging the signs:

=> 115 ÷ 5 + 14 × 6 − 15

=> 23 + 14 × 6 − 15

=> 23 + 84 - 15

=> 107 - 15

=> 92

Hence, the correct answer is "Option 1".

Q78. Answer: (b) 13 km to the south

Given:

Sunil starts from Point A and drives 57 km towards west.

Then he takes a left turn and drives 65 km.

Turns left and drives 67 km.

Again takes a left turn and drives 78 km.

Finally takes a left turn and drives 10 km to reach Point P.

Calculate final position:

West = 67 km and East = 67 km cancel each other.

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North = 78 km

South = 65 km

Remaining distance = 78 − 65 = 13 km towards North.

So Point P is 13 km North of Point A.

To reach Point A again, Sunil must travel 13 km towards South.

Therefore, the required distance and direction is 13 km towards South.

Hence, the correct answer is "Option 2".

Q79. Answer: (a) FE

Given:

Six people A, B, C, D, E and F are sitting in a row facing north.

E sits to the immediate right of D.

F sits fourth to the left of D.

Only one person sits between B and D.

C sits to the immediate left of B.

A sits second to the left of E.

Checking the options:

FE → Not adjacent

BA → Adjacent

CB → Adjacent

AD → Adjacent

Three options contain adjacent pairs, but FE does not.

Therefore, FE does not belong to the group.

Hence, the correct answer is "Option 1".

Q80. Answer: (d) 190

The logic followed here is: The series follows a pattern where the difference between consecutive terms decreases by 2.

Therefore, the number that should come in place of the question mark is 190.

Hence, the correct answer is "Option 4".

Q81. Answer: (c) Makhana Board

The correct answer is Makhana Board.

Key Points

• During the presentation of the Union Budget 2025–26 on February 1, 2025, Union Finance Minister Nirmala Sitharaman announced the establishment of a Makhana Board in the state of Bihar.

• The primary objective of the Makhana Board is to provide a structured institutional framework for the research, production, processing, and international branding of Makhana (also known as foxnuts or Gorgon nuts).

• Bihar is the undisputed leader in Makhana production, contributing more than 85% to 90% of the total global supply, making it a vital component of the state's agrarian economy.

• The board is expected to help farmers adopt modern technology for harvesting and processing, which is currently labor-intensive and largely traditional.

• This initiative aims to improve the income of nearly 5 lakh farmers and workers who are involved in the Makhana value chain, particularly in the Mithila region.

Additional Information

• Mithila Makhana GI Tag: In August 2022, the Government of India granted the Geographical Indication (GI) Tag to Mithila Makhana. This legal protection ensures that only makhana produced in the Mithila region can use the name, preventing misuse and enhancing export value.

• Nutritional Value: Makhana is considered a superfood globally. It is gluten-free, rich in protein, calcium, and magnesium, and has a low glycemic index, making it popular in health-conscious markets.

• One District One Product (ODOP): Under the ODOP scheme, Makhana was already identified as a focus crop for several districts in Bihar, including Darbhanga, Madhubani, and Saharasa.

• Cultivation Details: It is an aquatic crop grown in ponds and wetlands. The seeds are collected from the bottom of the water bodies, cleaned, and then roasted until they pop into white kernels.

• Economic Impact: The establishment of a dedicated board will facilitate direct exports to countries like the USA, Canada, and European nations, where the demand for organic snacks is rising.

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Important Points

• Union Budget 2025-26 Context: The budget placed a strong emphasis on the Purvoday plan, which aims for the all-round development of the eastern states of India, including Bihar, West Bengal, Odisha, and Andhra Pradesh.

• Research Facilities: The National Research Centre for Makhana, located in Darbhanga, Bihar, will likely work in synergy with the new board to improve seed quality and pest management.

• Financial Support: The Makhana Board will act as a facilitator for providing credit facilities and subsidies to micro-enterprises involved in foxnut processing.

• Industrial Nodes: Along with the Makhana Board, the budget highlighted the development of industrial corridors in Gaya and Bodh Gaya to boost employment in the state.

Q82. Answer: (b) Hindustan Aeronautics Limited

The correct answer is Hindustan Aeronautics Limited.

Key Points

• In September 2025, a historic milestone was achieved in the Indian space sector with the signing of the 100th technology transfer agreement.

• This specific agreement was jointly signed by the Indian Space Research Organisation (ISRO), the Indian National Space Promotion and Authorization Centre (IN-SPACe), and NewSpace India Limited (NSIL).

• The primary partner for the manufacturing and production of the Small Satellite Launch Vehicle (SSLV) under this agreement is Hindustan Aeronautics Limited (HAL).

• The transfer of technology (ToT) is aimed at enabling the private sector and Public Sector Undertakings (PSUs) to lead the end-to-end production of launch vehicles, thereby reducing ISRO's burden of routine launches.

• This collaboration ensures that HAL, with its extensive experience in aerospace manufacturing, will play a central role in scaling up the production of SSLVs to meet global demand for small satellite launches.

Additional Information

• Small Satellite Launch Vehicle (SSLV):

• The SSLV is a 3-stage All-Solid Vehicle capable of launching up to 500 kg satellite mass into 500 km Low Earth Orbit (LEO).

• It is designed for low cost, with a low turnaround time, flexibility in accommodating multiple satellites, and minimal launch infrastructure requirements.

• The launch vehicle is ideally suited for the burgeoning small satellite market, providing "launch-on-demand" capabilities.

• Hindustan Aeronautics Limited (HAL):

• HAL is an Indian state-owned aerospace and defence company headquartered in Bengaluru.

• It was established on 23 December 1940 as Hindustan Aircraft Limited by Walchand Hirachand.

• It operates under the management of the Ministry of Defence and has been a long-standing partner of ISRO, providing structural components and liquid engine tanks for various missions.

• NewSpace India Limited (NSIL):

• NSIL is a Central Public Sector Enterprise (CPSE) and the commercial arm of the Department of Space (DoS).

• It was incorporated in March 2019 to commercially exploit the R&D work of ISRO.

Important Points

• IN-SPACe: It acts as a single-window, autonomous, nodal agency to promote, authorize, and supervise space activities of Non-Governmental Entities (NGEs).

• Space Reforms: The transfer of SSLV technology to HAL is a core part of the 2020 Space Sector Reforms, which aim to transition the Indian space program from a supply-driven model to a demand-driven model.

• Global Market: By handing over the production to HAL, India aims to capture a larger share of the global small satellite launch services market, which is expected to grow significantly by 2030.

• Technological Self-reliance: This move fosters Atmanirbhar Bharat in the high-technology niche of space transportation systems.

Q83. Answer: (c) 28

The correct answer is 28.

Key Points

• The Khelo India Youth Games (KIYG) 2025 marked the 8th edition of this prestigious national-level multi-sport competition.

• For the 2025 edition, the Ministry of Youth Affairs and Sports featured a total of 28 sports disciplines, showcasing the diverse athletic talent across the country.

• The games were hosted by the state of Bihar for the first time in the history of the tournament, with the primary venues located in Patna and Rajgir.

• The event took place in January 2025, continuing the tradition of holding the games during the school and college winter break to

maximize student participation.

• The inclusion of 28 sports reflects the steady expansion of the Khelo India initiative, which aims to provide a platform for young athletes in both Olympic and traditional Indian sports.

• More than 6,000 athletes from all States and Union Territories participated in the competition, competing for medals and the chance to be identified for long-term athlete development programs.

Additional Information

• Evolution of Khelo India:

• The program was originally launched as the Khelo India School Games in 2018 in New Delhi.

• In 2019, the scope was expanded, and it was renamed the Khelo India Youth Games, allowing for two categories: Under-17 school students and Under-21 college students.

• Host States History:

• The 2024 edition was held in Tamil Nadu, while the 2023 edition was hosted by Madhya Pradesh across eight different cities.

• Maharashtra and Haryana have historically been the most successful states, often topping the medal tally in various editions.

• Inclusion of Indigenous Sports:

• One of the unique features of the Khelo India Youth Games is the promotion of traditional Indian sports such as Gatka, Kalaripayattu, Thang-Ta, Silambam, and Mallakhamba.

• These sports are included alongside mainstream disciplines like Athletics, Swimming, Archery, Wrestling, and Boxing.

• Scholarship and Support:

• The Talent Identification Development Committee (TIDC) identifies promising athletes during these games.

• Selected athletes receive an annual financial assistance of Rs. 5 lakh for 8 years to support their training and preparation for international events like the Olympics.

• Organizational Structure:

• The games are organized by the Sports Authority of India (SAI) in collaboration with the Indian Olympic Association (IOA) and the respective host state government.

• The primary objective of the Khelo India Program is to revive the sports culture in India at the grass-root level by building a strong framework for all sports played in the country.

Important Points

• The Bihar Government invested heavily in sports infrastructure for the 2025 games, notably the State Sports Academy and Bihar Sports University in Rajgir.

• The mascot for the games often highlights the local biodiversity or cultural heritage of the host state; for Bihar, the focus remained on its rich historical legacy and environmental symbols.

• The Khelo India Youth Games serves as a crucial feeder system for the Target Olympic Podium Scheme (TOPS), ensuring a pipeline of world-class athletes for India.

Q84. Answer: (b) 6 May 2025

The correct answer is 6 May 2025.

Key Points

• The United Nations Development Programme (UNDP) officially released the Human Development Report (HDR) 2025 on 6 May 2025.

• This specific report is based on comprehensive global data collected and analyzed for the year 2023, providing a retrospective look at human progress two years prior to the release.

• The Human Development Report is an annual milestone publication that assesses the state of human development globally, focusing on metrics beyond mere economic growth.

• It introduces the Human Development Index (HDI) rankings for member nations, which serves as a critical benchmark for international comparison of social and economic development levels.

• The release date of 6 May 2025 was chosen to ensure the inclusion of the most accurate and verified statistical indicators from various international data agencies for the 2023 period.

Additional Information

• Human Development Index (HDI):

• The HDI is a composite index that measures average achievement in three basic dimensions: a long and healthy life, knowledge, and a decent standard of living.

• It was first introduced in 1990 by Pakistani economist Mahbub ul Haq and Indian Nobel laureate Amartya Sen.

• The indicators used include Life Expectancy at Birth, Expected Years of Schooling, Mean Years of Schooling, and Gross National Income (GNI) per capita.

• United Nations Development Programme (UNDP):

• The UNDP is the UN's global development network, established on 22 November 1965.

• Headquartered in New York City, it works in nearly 170 countries to help eliminate poverty and achieve sustainable economic growth and human development.

• The organization publishes the HDR to shift the focus of development economics from national income accounting to people-centered policies.

• Significance of the 2025 Report:

• By utilizing 2023 data, the 2025 report captures the long-term trends and recovery patterns following global disruptions, such as health crises and geopolitical shifts.

• It often includes supplementary indices like the Gender Inequality Index (GII) and the Multidimensional Poverty Index (MPI) to provide a holistic view of global challenges.

• The report serves as a primary resource for governments, NGOs, and researchers to formulate policies that target specific gaps in education, healthcare, and income parity.

Important Points

• The HDR 2025 release on 6 May 2025 highlights the importance of data transparency and the lag time required for the United Nations to verify 2023 statistics across all sovereign territories.

• The report typically categorizes countries into four groups: Very High, High, Medium, and Low Human Development, based on their HDI score which ranges from 0 to 1.

• Recent reports have increasingly focused on the Planetary pressures-adjusted Human Development Index (PHDI), reflecting the impact of carbon emissions and material footprint on global progress.

Q85. Answer: (d) Sundays on Cycle

The correct answer is Sundays on Cycle.

Key Points

• The event titled Sundays on Cycle was organized as a premier cycling initiative under the Fit India Movement to promote a healthy lifestyle and environmental sustainability.

• Staged in February 2025, the event commenced from the iconic Gateway of India in Mumbai, attracting thousands of participants, including fitness enthusiasts, professional cyclists, and celebrities.

• The core objective of the Sundays on Cycle event is to provide a solution to rising pollution levels by encouraging citizens to use bicycles for short commutes, thereby reducing the carbon footprint.

• It serves as a platform to raise awareness about physical fitness and the mental health benefits associated with regular outdoor activities, aligning with the national vision of a Pliant and Healthy India.

• The event was supported by various government ministries and local municipal corporations to ensure a car-free experience on designated routes during the event hours.

Additional Information

• Fit India Movement:

• Launched by Prime Minister Narendra Modi on August 29, 2019, on the occasion of National Sports Day.

• The movement aims to bring about a behavioral change and move towards a more physically active lifestyle to combat lifestyle diseases like diabetes, obesity, and hypertension.

• National Sports Day:

• Celebrated every year on August 29 to commemorate the birth anniversary of the Indian hockey legend, Major Dhyan Chand.

• This day serves as the backdrop for many national health and sports initiatives, including the National Sports Awards.

• Environmental Benefits of Cycling:

• Cycling is a zero-emission mode of transport that helps in reducing greenhouse gas emissions and mitigating urban air pollution.

• Cities like Mumbai, Delhi, and Bengaluru are increasingly adopting cycle tracks and public bike-sharing systems to promote sustainable urban mobility.

• Health Advantages:

• Regular cycling improves cardiovascular fitness, increases muscle strength and flexibility, and decreases stress levels.

• It is recognized as one of the most effective aerobic exercises for all age groups, contributing significantly to the Fit India mission's goals.

Important Points

• The Sundays on Cycle initiative is often linked with the "Cycles4Change" challenge, which was a part of the Smart Cities Mission under the Ministry of Housing and Urban Affairs (MoHUA).

• During the February 2025 event, special "Green Corridors" were created in South Mumbai to ensure the safety of the participants and to demonstrate the feasibility of dedicated cycling infrastructure in metropolitan cities.

• Such events are crucial for India's commitment to the Sustainable Development Goals (SDGs), specifically Goal 3 (Good Health

and Well-being) and Goal 11 (Sustainable Cities and Communities).

Q86. Answer: (c) P Vimala

The correct answer is P Vimala.

Key Points

• P. Vimala has been honored with the Sahitya Akademi Translation Prize 2024 for her exceptional work in translating a Malayalam autobiography into Tamil.

• The translation is based on the autobiography of the legendary Kerala political leader K. R. Gowri Amma, originally titled Atmakatha. In Tamil, the translated work is titled K. R. Gowri Amma: Suya Charitham.

• The Sahitya Akademi announced the winners for the 2024 translation awards across various Indian languages, and the formal presentation ceremony is scheduled for March 2025.

• The prize is awarded to the best translation published in the five years immediately preceding the year of the award (between January 2018 and December 2022 for the 2024 cycle).

• This recognition highlights P. Vimala's contribution to cross-cultural literature and her skill in bringing the life story of a prominent Communist leader and social reformer to the Tamil-speaking audience.

Additional Information

• Sahitya Akademi Translation Prize:

• Instituted in 1989, this prize is awarded annually by India's National Academy of Letters to encourage translations of high literary quality.

• The award carries a cash prize of Rs. 50,000 along with a citation and an engraved plaque.

• It aims to promote national integration by making literature from one Indian language accessible to readers of another language.

• Other Awardees for 2024:

• Chandan Negi: She won the Sahitya Akademi Translation Prize 2024 in the Punjabi language category for her translation of The Legend of Lakshmi Prasad (originally by Twinkle Khanna in English).

• Uttara Bwiswmuthiary: A recipient of the 2024 prize for Bodo translation, she translated the Assamese novel Aseema (written by Kanchan Baruah) into the Bodo language.

• Madan Soni: He received the prize in the Hindi category for translating the classic Kannada novel Samskara, written by the Jnanpith awardee U.R. Ananthamurthy.

• K. R. Gowri Amma (Original Author):

• She was one of the founding leaders of the Communist movement in Kerala and the first woman minister in independent Kerala (1957).

• Her autobiography provides deep insights into the land reforms and the socio-political evolution of Kerala during the 20th century.

Important Points

• The Sahitya Akademi, established on March 12, 1954, functions as an autonomous organization under the Ministry of Culture, Government of India.

• The selection for the Translation Prize is made by a three-member Selection Committee for each language, following a rigorous process of evaluation.

• The award year 2024 saw winners across 24 Indian languages, including Sanskrit, English, and major regional languages, reinforcing the linguistic diversity of the nation.

• Recipients are selected based on the accuracy, stylistic merit, and readability of the translated text compared to the original work.

Q87. Answer: (c) Defence Exim Portal

The correct answer is Defence Exim Portal.

Key Points

• The Defence Exim Portal was officially launched during the National Conference on ‘Opportunities of Defence Manufacturing in the Country’ held on October 7, 2025.

• This portal is a significant digital initiative by the Ministry of Defence, aimed at consolidating and streamlining the processes related to export and import authorisations in the Indian defence sector.

• The primary objective of the portal is to enhance the Ease of Doing Business by providing a Single Window interface for Indian defence exporters and importers to interact with regulatory authorities.

• It replaces manual or fragmented digital systems with an integrated end-to-end digital solution, allowing for real-time tracking of applications, which ensures high levels of transparency and accountability in the administrative workflow.

• The portal is designed to significantly reduce the turnaround time for obtaining necessary clearances, thereby making the Indian defence industry more competitive in the global market. Hence, the correct answer is Defence Exim Portal.

Additional Information

• Growth of Defence Exports:

• India’s defence exports have reached an unprecedented milestone, crossing Rs. 21,083 crore in the financial year 2023-24, reflecting a growth of over 30% compared to the previous year.

• The government has set an ambitious target to achieve defence exports worth Rs. 50,000 crore by the year 2028-29.

• Aatmanirbharta in Defence:

• The launch of the portal aligns with the vision of Aatmanirbhar Bharat (Self-reliant India), aiming to transform India from a net importer to a significant global exporter of defence equipment.

• The Department of Defence Production (DDP) has been instrumental in notifying Positive Indigenisation Lists, which mandate that certain items be procured only from domestic sources.

• Make in India Initiative:

• Under the Make in India program, the government has simplified the Industrial Licensing process and increased the Foreign Direct Investment (FDI) limit to 74% through the automatic route in the defence sector.

• Strategic partnerships and Defence Excellence (iDEX) are fostering innovation among MSMEs and Startups to create cutting-edge technology for the Armed Forces.

Important Points

• Department of Defence Production (DDP): The DDP is the nodal agency responsible for the development and regulation of the defence industry and the implementation of the Defence Exim Portal.

• Simplification of Procedures: The portal facilitates the online filing of applications for Export Authorisations, No Objection Certificates (NOCs), and End User Certificates, which are critical for international trade in sensitive technologies.

• Global Outreach: By digitizing the EXIM process, India aims to strengthen its ties with friendly foreign nations through the timely supply of high-quality military hardware, including the BrahMos Missile, Tejas Aircraft, and various Artillery Systems.

• Policy Framework: The Defence Acquisition Procedure (DAP) 2020 further supports these digital reforms by prioritizing Buy {Indian-IDDM} (Indigenously Designed, Developed and Manufactured) categories to boost local production.

Q88. Answer: (c) Ministry of Environment, Forest & Climate Change

p>The correct answer is Ministry of Environment, Forest & Climate Change.

Key Points

• The International Big Cat Alliance (IBCA) is a global initiative led by India that operates under the administrative control of the Ministry of Environment, Forest and Climate Change (MoEFCC).

• In January 2025, the alliance officially transitioned into a treaty-based international organization, following the approval of its framework by the Union Cabinet and the subsequent signing of the treaty by several range countries.

• The primary goal of the IBCA is to ensure the survival and conservation of the seven big cat species found globally, namely the Tiger, Lion, Leopard, Snow Leopard, Cheetah, Jaguar, and Puma.

• The headquarters of the International Big Cat Alliance is established in India, serving as a central hub for coordinating conservation efforts across 96 big cat range countries and other non-range countries and international organizations.

• The Union Cabinet, chaired by Prime Minister Narendra Modi, had earlier approved the establishment of the IBCA in February 2024 with a focused one-time budgetary support. Hence, the correct answer is the Ministry of Environment, Forest & Climate Change.

Additional Information

• Launch Details:

• The International Big Cat Alliance was formally launched by Prime Minister Narendra Modi on April 9, 2023.

• The launch took place in Mysuru, Karnataka, during a mega event organized to commemorate the 50th anniversary of Project Tiger.

• Financial Support:

• The Government of India committed a total financial assistance of Rs. 150 crore for a period of five years, spanning from 2023-24 to 2027-28.

• This funding is intended to support the initial setup, secretariat operations, and core conservation projects of the alliance.

• Conservation Strategy:

• The alliance focuses on knowledge sharing, capacity building, and technical assistance among member countries to mitigate human-wildlife conflict.

• It aims to promote eco-tourism and sustainable livelihoods for communities living near big cat habitats, especially in the Global South.

• Member Species:

• Out of the seven big cats, five species (Tiger, Lion, Leopard, Snow Leopard, and Cheetah) are naturally found in India (Cheetah

being recently reintroduced).

• The inclusion of Jaguar and Puma allows for a truly global cooperation including South American and North American range countries.

Important Points

• Organizational Structure:

• The IBCA consists of a General Assembly, which is the supreme decision-making body, a Council, and a Secretariat based in India.

• The Environment Minister of India often represents the nation at the high-level meetings regarding the alliance's treaty framework.

• Legal and Treaty Status:

• The transition to a treaty-based organization in January 2025 provides the IBCA with a legal personality similar to other international bodies like the International Solar Alliance (ISA).

• This status enables the alliance to enter into agreements with other international agencies and receive funding from multilateral development banks.

• Global Leadership:

• By leading the IBCA, India strengthens its position as a global leader in biodiversity conservation, having successfully increased its own populations of Tigers and Lions.

• The Ministry of Environment, Forest and Climate Change oversees the implementation of the Wildlife Protection Act, 1972, which provides the domestic legal framework for big cat protection in the country.

Q89. Answer: (b) remain valid

The correct answer is remain valid.

Key Points

• According to the Reserve Bank of India (RBI) guidelines, when a banking entity undergoes a name change or rebranding, the transition is managed to ensure minimal disruption to customer services.

• In the instance of North East Small Finance Bank Limited (which underwent a transition in May 2025), the RBI ensures that technical identifiers such as the IFSC (Indian Financial System Code) and MICR codes remain valid to facilitate uninterrupted NEFT, RTGS, and IMPS transactions. Hence, the statement regarding their validity is correct.

• Existing cheque books issued under the former name remain valid and can be used by the customers until the leaves are exhausted or until a specific "sunset date" is announced by the bank. Hence, the statement that they remain valid is correct.

• The RBI mandate ensures that customers do not face the immediate burden of re-issuance of documents, which is particularly vital for Small Finance Banks that serve rural and semi-urban populations.

• This administrative protocol is standard for all scheduled commercial banks in India to maintain the integrity of the payment and settlement systems during corporate restructuring or name changes.

Additional Information

• Reserve Bank of India (RBI):

• Established on April 1, 1935, under the Reserve Bank of India Act, 1934, the RBI is the central bank of India.

• It regulates the banking system under the Banking Regulation Act, 1949, and has the authority to approve name changes, mergers, and licenses for banks.

• Small Finance Banks (SFBs):

• SFBs are a specific category of banks established to provide financial inclusion to sections of the economy not being served by other banks, such as small business units, small and marginal farmers, and micro industries.

• They were established based on the recommendations of the Nachiket Mor Committee.

• The North East Small Finance Bank is a key player in the North-Eastern region of India, headquartered in Guwahati, Assam.

• IFSC and MICR Codes:

• IFSC is an 11-character alphanumeric code used to uniquely identify bank branches participating in the major electronic funds transfer systems in India.

• MICR (Magnetic Ink Character Recognition) is a 9-digit code used primarily to facilitate the processing and clearance of cheques.

Important Points

• Banking Regulation Act, 1949: This Act provides the legal framework for the RBI to supervise commercial banks. Any change in the name of a bank must be notified in the Gazette of India.

• Customer Communication: While instruments remain valid, banks are required to inform customers about the change through official websites, SMS, and branch notices to avoid confusion.

• Validity of Debit/Credit Cards: Similar to cheque books, existing ATM and Debit cards remain valid until their expiry date, after

which the bank issues new cards with the updated branding.

• Legal Continuity: A name change does not affect any rights or obligations of the bank, nor does it render defective any legal proceedings by or against the bank.

Q90. Answer: (d) Defence Research and Development Organisation (DRDO)

The correct answer is Defence Research and Development Organisation (DRDO).

Key Points

• The Defence Research and Development Organisation (DRDO) successfully conducted the maiden flight-tests of the indigenous Integrated Air Defence Weapon System in August 2025.

• The tests were carried out at the Integrated Test Range (ITR) in Chandipur, off the coast of Odisha, to validate the system's interception capabilities against high-speed aerial threats.

• This weapon system is designed to provide a multi-layered defense umbrella, capable of neutralizing Unmanned Aerial Vehicles (UAVs), fighter aircraft, and incoming cruise missiles.

• The flight-test achieved all mission objectives, including the successful tracking of targets by Active Electronically Scanned Array (AESA) radars and precise engagement by the interceptor missiles.

• The successful trial in August 2025 marks a significant milestone in India's quest for self-reliance in critical defense technologies under the Atmanirbhar Bharat mission.

Additional Information

• Defence Research and Development Organisation (DRDO):

• It was established in 1958 by merging the Technical Development Establishment of the Indian Army and the Directorate of Technical Development & Production with the Defence Science Organisation.

• Headquartered in New Delhi, it operates under the Ministry of Defence and aims to empower India with cutting-edge defense technologies.

• Major successful programs include the Agni and Prithvi series of missiles, Tejas Light Combat Aircraft, and the Arjun Main Battle Tank.

• Air Defence Systems in India:

• India utilizes a variety of systems including the Akash missile system, which is a short-range surface-to-air missile (SAM) system developed by DRDO.

• The MRSAM (Medium Range Surface-to-Air Missile) is another critical asset developed in collaboration with Israel to protect vital installations.

• The integration of various sensors and weapon platforms into a single command network is the core objective of the Integrated Air Defence strategy.

Important Points

• The Integrated Air Defence Weapon System tested in August 2025 features a high level of automation, significantly reducing the reaction time required to counter saturation attacks.

• The Integrated Test Range (ITR) at Chandipur is a world-class facility that provides the necessary infrastructure for the performance evaluation of rockets, missiles, and airborne weapon systems.

• With the induction of such systems, the Indian Armed Forces—comprising the Army, Navy, and Air Force—gain a unified defensive posture against modern Electronic Warfare and stealth technologies.

• The participation of private sector industries in the manufacturing of components for this system highlights the growing Defence Industrial Base in the country.

Q91. Answer: (a) 2 June

The correct answer is 2 June.

Key Points

• International Sex Workers' Day is observed annually on 2 June to honor sex workers and acknowledge their often-exploitative working conditions.

• The origin of this day dates back to 1975, when more than 100 sex workers occupied the Saint-Nizier Church in Lyon, France.

• The occupation was a protest against police brutality, fines, and the criminalization of their livelihood, which forced them to work in secret and dangerous environments.

• On 10 June 1975, the police brutally cleared the church, but the movement had already gained international attention, leading to the establishment of the day as a global event.

• In India, various collectives and Non-Governmental Organizations (NGOs) observe this day to demand labor rights, social security, and the decriminalization of sex work to ensure the safety of those involved.

Additional Information

• Significance and Symbols:

• The Red Umbrella is the global symbol for sex workers' rights. It was first used by sex workers in Venice, Italy, in 2001 during the 49th Venice Biennale.

• The day is also colloquially known as International Whores' Day in many parts of the world, reclaiming the term to fight against social stigma.

• Related Observances:

• International Day to End Violence Against Sex Workers is observed on December 17 every year. It focuses on the high rates of violence and hate crimes committed against the community.

• International Sex Workers' Rights Day is celebrated on March 3, which specifically emphasizes the human rights aspect and legal protections.

• Context in India:

• In India, sex work is governed by the Immoral Traffic (Prevention) Act, 1956 (ITPA). While the act of selling sex is not per se illegal, activities like pimping, operating a brothel, and soliciting in public are criminalized.

• Major organizations like the Durbar Mahila Samanwaya Committee (DMSC) in Kolkata (Sonagachi) and the All India Network of Sex Workers (AINSW) play a vital role in advocating for the community's welfare.

Important Points

• Judicial Interventions:

• The Supreme Court of India, in the case of Budhadev Karmaskar v. State of West Bengal (2011), stated that sex workers are also entitled to a life of dignity under Article 21 of the Constitution.

• In May 2022, the Supreme Court directed that police should neither interfere nor take criminal action against adult sex workers participating in consensual sex work, recognizing it as a profession.

• Health and Welfare:

• The National AIDS Control Organisation (NACO) works extensively with sex workers through Targeted Interventions (TI) to reduce the prevalence of HIV/AIDS and other STIs.

• The Government of India provides various social welfare schemes, including the distribution of Aadhaar cards and ration cards to sex workers following the Supreme Court's directions during the COVID-19 pandemic.

Q92. Answer: (d) SCO

The correct answer is SCO.

Key Points

• Indian Prime Minister Narendra Modi announced the resumption of direct flights between India and China during the Shanghai Cooperation Organisation (SCO) summit in August 2025.

• Direct flight services between the two most populous nations had been suspended for more than five years, having been halted in March 2020.

• The suspension was originally triggered by the COVID-19 pandemic, but the resumption was delayed due to the prolonged military standoff at the Line of Actual Control (LAC) in Eastern Ladakh following the Galwan Valley clash.

• The announcement signifies a major step toward de-escalating diplomatic tensions and restoring people-to-people ties and economic cooperation between New Delhi and Beijing.

• The decision followed multiple rounds of high-level talks, including meetings of the Working Mechanism for Consultation and Coordination (WMCC) on India-China Border Affairs.

Additional Information

• Shanghai Cooperation Organisation (SCO):

• It is a permanent intergovernmental international organization established on 15 June 2001 in Shanghai, China.

• The SCO currently comprises nine member states: India, Iran, Kazakhstan, China, Kyrgyzstan, Pakistan, Russia, Tajikistan, and Uzbekistan.

• India and Pakistan became full members of the SCO during the Astana Summit in June 2017.

• Civil Aviation Context:

• Before the 2020 suspension, airlines such as IndiGo, Air India, China Southern, and Air China operated frequent flights connecting Delhi and Mumbai to Beijing, Shanghai, and Guangzhou.

• During the suspension period, travelers had to rely on expensive and time-consuming connecting flights through hubs like Hong Kong, Dubai, or Singapore.

• Other Platforms:

• BRICS: An acronym for Brazil, Russia, India, China, and South Africa (now expanded), which also facilitates bilateral meetings but was not the primary venue for this 2025 announcement.

• G20: A premier forum for international economic cooperation; while India and China are members, the SCO served as the specific regional platform for this diplomatic breakthrough.

• ASEAN: The Association of Southeast Asian Nations; India and China interact here as dialogue partners, focusing on regional stability in Southeast Asia.

Important Points

• The SCO is often described as the "Alliance of the East" and is the world's largest regional organization in terms of geographic scope and population, covering approximately 60% of the area of Eurasia.

• The resumption of flights in 2025 is expected to provide a significant boost to bilateral trade, which remained robust even during the border standoff, exceeding $100 billion in previous fiscal years.

• Restoring direct connectivity was a long-standing demand of the Indian diaspora, export-import businesses, and international students enrolled in Chinese universities.

Q93. Answer: (d) 71st

The correct answer is 71st.

Key Points

• The Energy Transition Index (ETI) is an annual report published by the World Economic Forum (WEF), which tracks the transition of various nations toward a more sustainable, secure, and affordable energy future.

• In the 2025 index, India has been ranked at the 71st position among 120 countries globally.

• The index benchmarks countries based on two main pillars: System Performance (which includes energy equity, security, and sustainability) and Transition Readiness (the enabling environment for future changes).

• India is recognized for its significant improvements in energy equity and security, driven by massive electrification programs and the expansion of its renewable energy portfolio.

• The report emphasizes that while India is making strides in solar and wind energy, maintaining a balance between economic growth and environmental sustainability remains a critical challenge.

Additional Information

• World Economic Forum (WEF):

• The WEF is an international non-governmental organization established on 24 January 1971.

• It is headquartered in Cologny, Switzerland, and is best known for its annual meeting in Davos.

• The organization promotes public-private cooperation to shape global, regional, and industry agendas.

• Global Rankings:

• Nordic countries consistently lead the Energy Transition Index. For recent cycles, Sweden has often occupied the 1st rank, followed by Denmark and Finland.

• These countries are praised for their advanced carbon pricing mechanisms and high share of non-fossil fuel energy in their total mix.

• India's Energy Targets:

• India has pledged to achieve 500 GW of non-fossil energy capacity by the year 2030.

• The country also aims to reach Net Zero carbon emissions by 2070, as announced during the COP26 summit in Glasgow.

• Initiatives like the National Green Hydrogen Mission are pivotal to improving India's future standing in the ETI.

Important Points

• The Energy Triangle: The ETI framework evaluates the "Energy Triangle," which consists of Economic Development and Growth, Environmental Sustainability, and Energy Access and Security.

• Transition Readiness: This evaluates the robustness of a country's institutional framework, capital and investment, innovation, and human capital dedicated to energy transition.

• Global Trends: The 2025 report notes a slowdown in the global pace of energy transition due to geopolitical tensions and energy security concerns, making India's progress particularly noteworthy.

• Data Source: The World Economic Forum collaborates with Accenture to produce this comprehensive analysis, involving data from the International Energy Agency (IEA) and other global energy bodies.

Q94. Answer: (a) Gujarat

The correct answer is Gujarat.

Key Points

• The state of Gujarat successfully executed a state-wide large-scale disaster management drill in November 2025, specifically designed to test the readiness of industrial sectors against hazardous incidents.

• This exercise focused heavily on oil and chemical disaster preparedness, addressing the unique risks associated with Gujarat's vast petrochemical and chemical manufacturing base.

• The drill was concentrated in major industrial corridors and hubs such as Jamnagar, Dahej, Mundra, and Hazira, which house some of the largest refineries and chemical complexes in the world.

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• Participating agencies included the National Disaster Response Force (NDRF), the State Disaster Response Force (SDRF), the Indian Coast Guard, and various District Disaster Management Authorities (DDMAs).

• The primary objective was to validate the Chemical (Industrial) Disaster Management Plan and ensure effective coordination between Government bodies and private sector stakeholders during a simulated emergency. Hence, the correct answer is Gujarat.

Additional Information

• Gujarat as a Petrochemical Hub:

• The state is often referred to as the Petro-capital of India, contributing significantly to the national output of petroleum products and chemicals.

• Jamnagar hosts the world's largest oil refinery complex, while Dahej is home to one of India's few Petroleum, Chemicals and Petrochemicals Investment Regions (PCPIR).

• Regulatory Framework:

• Industrial safety in India is regulated under the Manufacture, Storage and Import of Hazardous Chemical (MSIHC) Rules, 1989, which mandates regular safety audits and mock drills.

• The Gujarat State Disaster Management Authority (GSDMA), established under the Gujarat State Disaster Management Act, 2003, is the nodal agency for planning and implementing disaster mitigation strategies in the state.

• Types of Emergency Plans:

• On-site Emergency Plan: This is prepared by the occupier of the industrial facility to deal with emergencies within the factory premises.

• Off-site Emergency Plan: This is prepared by the District Collector to handle emergencies that might affect the public and environment outside the factory boundaries.

Important Points

• NDRF and SDRF: The National Disaster Response Force (NDRF) was constituted under the Disaster Management Act, 2005. It plays a critical role in specialized response to Chemical, Biological, Radiological, and Nuclear (CBRN) disasters.

• Technological Integration: During the 2025 drill, advanced tools like drones for aerial surveillance, GIS mapping for hazard zones, and real-time communication systems were utilized to enhance response speed.

• Maritime Safety: Since Gujarat has the longest coastline in India (approx 1600 km), the drill also included simulations for oil spills at major ports like Kandla (Deendayal Port) and Mundra to protect marine ecosystems.

• Public Awareness: A portion of the drill involved community evacuation protocols to educate the local population living near industrial clusters on how to react to sirens and toxic gas alerts.

Q95. Answer: (d) Nanjing, China

The correct answer is Nanjing, China.

Key Points

• The 2025 World Athletics Indoor Championships are scheduled to be held in Nanjing, China. This marks a significant milestone as it is the first time the prestigious event will be hosted in China.

• The championships will take place at the Nanjing's Cube, a purpose-built facility located in the Gymnasium of the Youth Olympic Sports Park. The venue was specifically designed to host world-class indoor track and field events.

• The Nanjing edition has a long history of rescheduling; it was originally awarded as the 2020 championships but was postponed to 2021, then 2023, and finally 2025 due to the ongoing challenges posed by the COVID-19 pandemic.

• The event is scheduled to take place from March 21 to March 23, 2025. It will feature the world's top athletes competing in various indoor disciplines, including sprints, hurdles, jumps, and throws.

• World Athletics made the decision to postpone the event multiple times to ensure the safety of athletes and technical officials while maintaining the integrity of the competition cycle. Hence, the correct answer is Nanjing, China.

Additional Information

• World Athletics Indoor Championships:

• It is a biennial (held every two years) athletics competition that began in 1985 as the World Indoor Games in Paris, France. It was later renamed in 1987.

• The 2024 edition was successfully held in Glasgow, United Kingdom, while the 2026 edition is set to be hosted in Torun, Poland.

• Host City Nanjing:

• Nanjing is the capital of Jiangsu province in China and has a rich history of hosting international multi-sport events, most notably the 2014 Summer Youth Olympic Games.

• The city's sports infrastructure is considered among the most advanced in Asia, making it a preferred location for World Athletics events.

• Competition Categories:

• The indoor championships differ from outdoor ones as they are held on a 200-meter track (compared to 400m outdoors) and do

not feature certain events like the javelin, discus, or hammer throw due to space constraints.

• Key events include the 60m sprint, 60m hurdles, 4x400m relay, Pole Vault, Triple Jump, and Shot Put.

Important Points

• Governing Body: The event is organized by World Athletics, formerly known as the IAAF (International Association of Athletics Federations). The current President is Sebastian Coe, who took office in 2015.

• Qualification Standards: Athletes must meet strict entry standards or qualify through their World Ranking to participate in the championships, ensuring only the elite tier of competitors is present.

• Economic Impact: Hosting the championships is expected to boost Nanjing's tourism and global profile, following the successful model of previous hosts like Portland (2016), Birmingham (2018), and Belgrade (2022).

• Sustainability: For the 2025 event, organizers have emphasized environmental sustainability and carbon neutrality in the operation of the Nanjing's Cube facility.

Q96. Answer: (b) About 65%

The correct answer is About 65%.

Key Points

• According to the Press Information Bureau (PIB) release titled 'Proactive Measures taken by CAQM to contain Air Pollution' dated 10 November 2025, there has been a significant decline in farm fire incidents in the northern states.

• For the state of Haryana, the total number of farm fire incidents recorded between 15 September and 9 November 2025 showed a remarkable reduction of About 65% compared to the same period in 2024.

• This data is monitored and reported by the Commission for Air Quality Management (CAQM) using a Standard Protocol developed by ISRO to track Active Fire Events (AFE).

• The reduction is attributed to the strict implementation of the State Action Plan, which involves both In-situ and Ex-situ crop residue management strategies.

• The decline in incidents in Haryana is a crucial factor in managing the Air Quality Index (AQI) of the National Capital Region (NCR), which typically deteriorates during the onset of winter due to stubble burning.

• Hence, the correct answer is About 65%.

Additional Information

• Commission for Air Quality Management (CAQM):

• The CAQM is a statutory body formed under the Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2021.

• It was established to ensure better coordination, research, identification, and resolution of problems surrounding the air quality index in the NCR and adjoining areas like Punjab, Haryana, Rajasthan, and Uttar Pradesh.

• Stubble Burning (Parali):

• This practice involves setting fire to the straw stubble that remains after harvesting grains like Paddy.

• It is primarily done to quickly clear the fields for the Rabi crop (wheat) sowing season.

• Burning releases large amounts of Carbon Monoxide (CO), Methane (CH4), and Particulate Matter (PM2.5 and PM10) into the atmosphere.

• Graded Response Action Plan (GRAP):

• GRAP is an emergency framework implemented by the CAQM to prevent further deterioration of air quality.

• It is divided into four stages: Stage I - 'Poor' (AQI 201-300), Stage II - 'Very Poor' (AQI 301-400), Stage III - 'Severe' (AQI 401-450), and Stage IV - 'Severe Plus' (AQI > 450).

Important Points

• Crop Residue Management (CRM) Scheme:

• The Central Government provides funds under the CRM scheme to subsidize machinery like Super Seeders, Happy Seeders, and Bio-decomposers.

• Farmers receive a 50% subsidy for individual machinery and 80% subsidy for establishing Custom Hiring Centres (CHCs).

• Legal and Monitoring Actions:

• The Supreme Court of India has frequently intervened to direct states to provide incentives to farmers to avoid burning.

• Environmental Compensation (EC) is imposed on farmers found violating the ban on stubble burning, with rates fixed based on the acreage of the land.

• In 2025, the use of remote sensing technology and flying squads helped in real-time detection and prevention of fire incidents in Haryana and Punjab.

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Q97. Answer: (b) September in Paris

p data-end="57" data-start="0">The correct answer is September in Paris.

Key Points

• The Ballon d'Or is the most prestigious individual award in the world of football, and the 2025 ceremony is scheduled to take place in September.

• The event will be hosted in Paris, France, which has served as the traditional home for the "Golden Ball" presentation since its inception.

• The 2025 edition marks a significant continuation of the partnership between France Football (Groupe Amaury) and UEFA, who began co-organizing the gala in 2024.

• The ceremony in September will evaluate performances from the 2024-2025 European football season, focusing on the period from August to July rather than the calendar year.

• This timing allows the football world to celebrate the achievements of players immediately following the conclusion of major summer tournaments and the domestic league cycles.

Additional Information

• History and Origin of the Award:

• The Ballon d'Or was established by the French news magazine France Football in the year 1956.

• The first ever recipient of the award was the legendary English player Stanley Matthews, who played for Blackpool at the time.

• Legendary Winners:

• Lionel Messi holds the record for the most Ballon d'Or titles in history, having secured 8 awards between 2009 and 2023.

• Cristiano Ronaldo follows him with 5 titles, representing a decade-long era of dominance by these two athletes in the sport.

• Expansion of Categories:

• In 2018, the Ballon d'Or Féminin was introduced to honor the best female football player in the world.

• Other significant accolades presented during the gala include the Kopa Trophy (for the best player under 21), the Yashin Trophy (for the best goalkeeper), and the Gerd Müller Trophy (for the highest-scoring striker).

Important Points

• Voting and Selection Criteria:

• The winner is determined by a specialized jury composed of 100 journalists from the top 100 FIFA-ranked nations.

• The primary criteria for selection include individual performance, the player's decisive and impressive character, and their contribution to team success and titles won.

• Venue and Atmosphere:

• The Théâtre du Châtelet in Paris is the frequent venue for this star-studded event, attracting the global football elite, including coaches, former legends, and club presidents.

• In the 2025 cycle, the focus remains on fair play and the class displayed by the player on the pitch, ensuring the award maintains its status as the ultimate recognition of sporting excellence.

Q98. Answer: (c) BRICS Summit

The correct answer is BRICS Summit.

Key Points

• Brazil officially assumed the chairmanship of the BRICS group for the year 2025, succeeding Russia.

• The BRICS Summit held in July 2025 placed a significant emphasis on Global South cooperation, reflecting Brazil's long-standing foreign policy priority of fostering ties among developing nations.

• Under Brazil’s leadership, the summit focused on critical issues such as inequality reduction, combating hunger, and the reform of international financial institutions like the IMF and World Bank to better represent emerging economies.

• The 2025 Summit served as a platform for the recently expanded BRICS+ members to align their strategies on climate action and sustainable development ahead of COP30, which Brazil is also scheduled to host.

• The emphasis on the Global South was intended to strengthen the collective bargaining power of nations in Africa, Asia, and Latin America within the global geopolitical landscape. Hence, the correct answer is the BRICS Summit.

Additional Information

• BRICS Expansion: Originally composed of Brazil, Russia, India, China, and South Africa, the group expanded in January 2024 to include Egypt, Ethiopia, Iran, and the United Arab Emirates, enhancing its representation of the Global South.

• Global South: This term refers to various countries often characterized as "developing" or "newly industrialized," primarily located in the Southern Hemisphere. It represents a shift in global economic power toward non-Western nations.

• G7 Summit: The Group of Seven consists of advanced economies including the USA, UK, France, Germany, Italy, Canada, and Japan. Unlike BRICS, it represents the Global North and traditional economic powers.

• APEC Summit: The Asia-Pacific Economic Cooperation is a regional economic forum established in 1989 to leverage the

growing interdependence of the Asia-Pacific. It includes 21 member economies but is not focused exclusively on the Global South.

• ASEAN Summit: The Association of Southeast Asian Nations is a regional organization that promotes economic, political, and security cooperation among its 10 member states in Southeast Asia.

Important Points

• New Development Bank (NDB): Often called the BRICS Bank, this institution is headquartered in Shanghai and provides financing for infrastructure projects in BRICS and other emerging economies, acting as an alternative to the World Bank.

• Rotating Chairmanship: The BRICS chairmanship rotates annually among its members. During its 2025 tenure, Brazil pushed for the use of local currencies in international trade to reduce dependence on the US Dollar.

• Geopolitical Influence: Collectively, BRICS members represent over 40% of the world's population and a significant portion of global GDP, making their summits crucial for global economic governance.

• Strategic Themes: Brazil's 2025 agenda also included energy transition and digital transformation, aiming to bridge the digital divide between the Global North and Global South.

Q99. Answer: (a) 171 million

The correct answer is 171 million.

Key Points

• According to the World Bank's Spring 2025 report titled "South Asia Development Update", India has made significant strides in poverty reduction, lifting approximately 171 million people out of extreme poverty over the past decade.

• The assessment is based on the International Poverty Line of $2.15 per person per day (measured at 2017 Purchasing Power Parity prices).

• The data indicates that the headcount poverty ratio in India declined from 21.6% in 2011-12 to around 8% to 10% by the end of the decade ending in 2021-22.

• This massive reduction highlights the impact of sustained Economic Growth and the expansion of Social Welfare Programs across the country.

• The report notes that India's performance was a major driver for the overall poverty reduction statistics in the South Asian region, despite the economic disruptions caused by the COVID-19 pandemic.

Additional Information

• Extreme Poverty Definition: The World Bank updated the global poverty line in September 2022 from $1.90 to $2.15 to reflect changes in Purchasing Power Parity (PPP) and the cost of living globally.

• Role of HCES: The Household Consumption Expenditure Survey (HCES) 2022-23, released by the Ministry of Statistics and Programme Implementation (MoSPI), provided the necessary data for economists to calculate recent poverty trends in India.

• Government Interventions: Key schemes such as the Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY), which provided free foodgrains to over 80 crore people, and the Jal Jeevan Mission, have been credited with improving the quality of life and reducing vulnerability.

• Multidimensional Poverty: Apart from income-based measures, the NITI Aayog’s Multidimensional Poverty Index (MPI) also showed a sharp decline, with 24.82 crore people escaping multidimensional poverty over the last 9 years.

• Global Context: India's achievement is considered one of the largest migrations out of poverty in human history, comparable to the poverty reduction seen in China during previous decades.

Important Points

• Timeline: The "past decade" referenced in the Spring 2025 report primarily covers the period from 2011-12 to 2021-22, using the most recent World Bank modeling.

• Economic Resilience: Despite global headwinds, the report emphasizes that India remains the fastest-growing major economy, which is a prerequisite for generating the resources needed for poverty alleviation.

• Data Reliability: The World Bank utilizes various sources, including official government surveys and Consumer Price Index (CPI) data, to ensure the 171 million figure accurately represents the shift in disposable income levels.

Q100. Answer: (b) Gold

The correct answer is Gold.

Key Points

• The Digi Yatra initiative, a flagship digital product of the Ministry of Civil Aviation, was honored with the Gold Award at the National Awards for e-Governance 2025.

• The award was conferred under the category "Application of Emerging Technologies for Providing Citizen Centric Services", recognizing its impact on modernizing air travel in India. Hence, the correct option is Gold.

• Digi Yatra is a biometric-enabled seamless travel experience based on Facial Recognition Technology (FRT), designed to provide a contactless and paperless journey at various touchpoints in airports.

• The project is implemented by the Digi Yatra Foundation (DYF), which is a joint venture company comprising the Airports

Authority of India (AAI) and private airport operators including IAL (Delhi), BIAL (Bengaluru), MIAL (Mumbai), GHIAL (Hyderabad), and CIAL (Cochin).

• The primary objective of the initiative is to enhance passenger throughput and security while significantly reducing the waiting time at checkpoints like entry gates, security checks, and boarding gates.

Additional Information

• National Awards for e-Governance:

• These awards are presented annually by the Department of Administrative Reforms and Public Grievances (DARPG), under the Ministry of Personnel, Public Grievances and Pensions.

• The awards aim to recognize and promote excellence in the implementation of e-Governance initiatives and to encourage the use of Information and Communication Technology (ICT) in government processes.

• There are usually multiple categories, including excellence in government process re-engineering, digital transformation, and research on citizen-centric services.

• Ministry of Civil Aviation (MoCA):

• The MoCA is responsible for formulation of national policies and programs for the development and regulation of the Civil Aviation sector in India.

• It oversees airport facilities, air traffic services, and carriage of passengers and goods by air.

• Current initiatives like UDAN (Ude Desh ka Aam Naagrik) and Digi Yatra are part of the ministry's vision to make flying accessible and high-tech for all.

Important Points

• Data Privacy and Security:

• One of the most critical features of Digi Yatra is its decentralized storage system. The Personally Identifiable Information (PII) of the passenger is stored locally on the user's mobile device in a distributed ledger.

• The data is not stored in any central server; it is shared with the airport of departure only for the duration of the flight and is purged within 24 hours of the flight's departure.

• Implementation Status:

• Initially launched at airports in Delhi, Bengaluru, and Varanasi in December 2022, the service has since expanded to major cities like Hyderabad, Pune, Vijayawada, and Kolkata.

• By 2024-2025, the government aims to implement Digi Yatra across all major airports in the country to standardize the digital travel experience.

• Technology Stack:

• It utilizes W3C standards for Verifiable Credentials and Decentralized Identifiers (DIDs), ensuring that India's digital public infrastructure remains at the forefront of global technological standards.

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