RRB Group D Official Paper (Held On: 12 Dec, 2025 Shift 1) (Previous Year Paper)

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

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GENERAL SCIENCE

Q1. A light ray passes through the centre of curvature of a convex mirror. What happens to it after reflection?

(a) It gets absorbed.
(b) It converges at the focus.
(c) It becomes parallel to the principal axis.
(d) It retraces its own path.

Q2. What is the minimum approximate work required to bring a car of mass 1500 kg moving at a velocity of 60 km/hr to rest?

(a) 4.68 × 10^5 J
(b) 2.08 × 10^5 J
(c) 1.56 × 10^5 J
(d) 6.25 × 10^5 J

Q3. What is the atomic mass of magnesium oxide?

(a) 32
(b) 45
(c) 40
(d) 35

Q4. What should be the position of the object, if a concave mirror forms a virtual, erect and enlarged image of the object?

(a) The object is placed between the focus and the centre of curvature.
(b) The object is placed at the centre of curvature of the mirror.
(c) The object is placed at the focus of the mirror.
(d) The object is placed between the pole and the focus of the mirror.

Q5. What is the atomic mass of oxygen?

(a) 18 u
(b) 16 u
(c) 8 u
(d) 12 u

Q6. Which of the following plants is unisexual?

(a) China rose
(b) Papaya
(c) Pea
(d) Mustard

Q7. A resistor of 4 Ω produces 64 J of heat every second. What is the potential difference across it?

(a) 8 V
(b) 16 V
(c) 16 A
(d) 64 A

Q8. What is the longevity period of egg in the fallopian tube in case of failure of fertilisation in human females?

(a) 3-4 days
(b) 6-7 days
(c) 1-2 days
(d) 4-5 days

Q9. Which of the following tissues makes the plant hard and stiff?

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

Q10. A mother who is malnourished during pregnancy is likely to:

(a) have a stronger immune system
(b) have a faster delivery
(c) give birth to an underweight baby
(d) produce more milk

Q11. Flushing of which gas is usually preferred in order to prevent the rancidity of the packaged food items?

(a) Nitric oxide
(b) Nitrogen dioxide
(c) Nitrogen
(d) Dinitrogen trioxide

Q12. Which of the following facilitates the communication between the central nervous system and the other parts of the body?

(a) Spinal cord
(b) Voluntary muscles
(c) Peripheral nervous system
(d) Involuntary muscles.

Q13. Which of the following statements about vacuoles is INCORRECT?

(a) Plant cells usually have a large central vacuole.
(b) Vacuoles are responsible for protein synthesis in the cell.
(c) Vacuoles in plant cells are filled with cell sap, which helps provide turgidity and rigidity.
(d) Vacuoles store important substances such as amino acids, sugars, organic acids and proteins.

Q14. Which of the following objects will sink in water? (Take the density of water as 1g/cm^3)

(i) An iron nail of density 2.5 g/cm^3
(ii) A iron block of density 0.83 g/cm^3
(iii) A iron ball of density 2 g/cm^3

(a) Both (i) and (ii)
(b) Only (iii)
(c) Only (ii)
(d) Both (i) and (iii)

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Q15. Which of the following statements is correct regarding the mitochondria in a plant cell?

(a) Mitochondria does not have its own DNA.
(b) Mitochondria performs photosynthesis.
(c) The mitochondrial inner membrane is deeply folded.
(d) Mitochondria has a single membranous covering.

Q16. Which of the following non-metals exhibits a metallic lustre despite being chemically non-metallic?

(a) Sulphur
(b) Iodine
(c) Phosphorus
(d) Nitrogen

Q17. Why is it impossible for two magnetic field lines to cross each other at a single point?

(a) Because they repel each other due to like polarity
(b) Because it would imply the compass needle could point in two directions simultaneously
(c) Because they are always parallel inside the magnet
(d) Because the magnetic field strength would be zero at that point

Q18. A yellow luminous flame is usually an indication of which of the following?

(a) Complete combustion
(b) Formation of carbon dioxide
(c) Combustion of metals
(d) Incomplete combustion with unburnt carbon particles

Q19. Which of the following statements is true according to the First Law of Motion?

(a) A rocket launching upward.
(b) A person continues to move forward when a car stops suddenly.
(c) A car accelerates when the engine is started.
(d) A stone falling freely under gravity.

Q20. Which of the following correctly describes an ion?

(a) An atom or group of atoms with a net electric charge
(b) An atom with more protons than neutrons
(c) A neutral molecule formed by ionic bonding
(d) A molecule that has gained or lost neutrons

Q21. Select the correct property of micelles in soap that help them to interact with water:

(a) hydrophobic tail
(b) hydrophillic head
(c) both hydrophilic head and hydrophobhic tail
(d) hydrocarbon

Q22. What do we call the motion of an object that travels equal distances in equal intervals of time, even when the time intervals are very small?

(a) Uniform motion
(b) Accelerated motion
(c) Circular motion
(d) Non-uniform motion

Q23. In which of the following media is the speed of sound the highest?

(a) Water
(b) Air at room temperature
(c) Iron
(d) Vacuum

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Q24. The extraction of metals from their ores is known as which of the following?

(a) Metallurgy
(b) Smelting
(c) Mining
(d) Refining

Q25. Which of the following statements is true about modern fish farming?

(a) All fish seeds are collected from rivers
(b) Hormones are used for fish breeding
(c) Enzymes are used to help fish grow bigger
(d) Fish farming cannot be done in ponds

MATHEMATICS

Q26. The minute hand of a large wall clock is 63 cm long. Using π = 22/7, find the length of the arc (in cm) traced by the tip of the minute hand in 11 seconds.

(a) 1.1
(b) 1.74
(c) 1.59
(d) 1.21

Q27. What is the third proportional to $54x^2$ and $18xy$?

(a) $6y^2$
(b) $7y^2$
(c) $5y^2$
(d) $4y^2$

Q28. Find the H.C.F. of 18, 54, and 72 is:

(a) 18
(b) 6
(c) 12
(d) 27

Q29. The value of [3 ÷ 2 × (7 - 2)] - (3 ÷ 2 of 6) - 2 is:

(a) 6.25
(b) 4.75
(c) 5.25
(d) 5.75

Q30. Simplify: $(x + 7)^2$

(a) $x^2 + 2x + 49$
(b) $x^2 + 49$
(c) $x^2 + 7x + 49$
(d) $x^2 + 14x + 49$

Q31. A class of 93 students took a Physics test. 10 students had an average score of 90. The remaining students had an average score of 75. What is the average score (rounded off to one decimal place) of the whole class?

(a) 74.9
(b) 71.8
(c) 76.6
(d) 86.7

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Q32. A rectangular aquarium with dimensions 60 cm × 45 cm × 40 cm is filled with water to 80% of its height. If a solid metallic cube of edge 20 cm is completely immersed in it, by how much does the water level rise (rounded off to two decimal places)?

(a) 2.76 cm
(b) 2.56 cm
(c) 2.36 cm
(d) 2.96 cm

Q33. The cost of a washing machine is 75% less than the cost of a TV. If the cost of the washing machine increases by 72% and that of the TV decreases by 20%, then what is the percentage change in the total cost of 4 washing machines and 3 TVs?

(a) Increase by 3%
(b) Decrease by 1%
(c) Increase by 6%
(d) Decrease by 8%

Q34. The sides of a triangle are 24 cm, 32 cm and 40 cm. What is the length of its altitude corresponding to the side with the length of 32 cm?

(a) 55 cm
(b) 24 cm
(c) 33 cm
(d) 43 cm

Q35. The difference between two numbers is 92. The ratio of the two numbers is 7 : 3. Which is the smaller of the two numbers?

(a) 79
(b) 69
(c) 96
(d) 63

Q36. If an item marked at Rs. 6,250 is sold for Rs. 250, then what is the discount percentage?

(a) 97%
(b) 95%
(c) 98%
(d) 96%

Q37. Pipe P can fill 2/5 part of a tank in 42 hours and pipe Q can fill 2/5 part of the same tank in 30 hours. Both P and Q were kept open for 5 hours, then both were closed. Pipe R alone was then opened and it emptied the water in the tank in 12 hours. Pipes P, Q and R together can fill the empty tank in:

(a) 71 hours
(b) 75 hours
(c) 94 hours
(d) 92 hours

Q38. 1/20 is what percentage of 9/90 ?

(a) 0.5
(b) 0.65
(c) 0.6
(d) 1

Q39. A 290-metre-long train crosses a platform thrice its length in 29 seconds. What is the speed of the train (in km/hr)?

(a) 153
(b) 147
(c) 144
(d) 138

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Q40. If 10% of 60% of 2/3 of a number is 841, then find the number.

(a) 20110
(b) 22530
(c) 21500
(d) 21025

Q41. Sohan sells a water bottle to Ronak at 28% profit. Ronak sells the water bottle to Rahul at a profit of 12.5%. If Rahul paid Rs. 288 for the water bottle, then for how much did Sohan buy it?

(a) Rs. 200
(b) Rs. 150
(c) Rs. 220
(d) Rs. 180

Q42. The arithmetic mean of the observations 27, 36, 12, 24, 48, 59, 60, 80 and 14 is:

(a) 31
(b) 36
(c) 38
(d) 40

Q43. A sum of money was invested at simple interest at a certain rate for 9 years. Had it been invested at an 8% per annum higher rate, it would have fetched Rs. 7,992 more. Find the principal.

(a) Rs. 12,200
(b) Rs. 11,100
(c) Rs. 10,200
(d) Rs. 11,200

Q44. A and B working together can do a piece of work in 6 days. B alone can do the same work in 14 days. How long (in days) will A alone take to do double the work?

(a) 24
(b) 22
(c) 21
(d) 10.5

Q45. A dealer makes a profit of 52% even after giving a 24% discount on the advertised price of a scooty. If he makes a profit of Rs. 6,526 on the sale of the scooty, what is the advertised price (in Rs.)?

(a) 25,132
(b) 25,103
(c) 25,065
(d) 25,100

Q46. In 10 years from now, A will be twice as old as B was 10 years ago. If A is 9 years older than B, find the present age of A.

(a) 40 years
(b) 48 years
(c) 38 years
(d) 44 years

Q47. A helicopter is flying at a height of 575 m. A person on the ground sees it at an angle of elevation of 30°. What is the horizontal distance from the person to the point on the ground exactly below the helicopter?

(Take √3 = 1.73)

(a) 994.75 m
(b) 896.75 m
(c) 895.75 m
(d) 990.75 m

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Q48. Simplify: $((2x^2y^{-1})^3)/((4xy)^4) \times ((4x^{-3}y^4)^3)/((2x^2y)^3)$

(a) $(3y^2)/(2x^{11})$
(b) $(y^2)/(4x^{13})$
(c) $(y^2)/(x^{11})$
(d) $1/(4x^{13})$

Q49. Find the area of the triangle if the lengths of its two perpendicular sides are 4 cm and 5 cm.

(a) 20 cm2
(b) 10 cm2
(c) 25 cm2
(d) 30 cm2

Q50. If A : B = 4 : 6 and B : C = 7 : 11, then A : B : C is:

(a) 4 : 12 : 33
(b) 4 : 31 : 21
(c) 11 : 23 : 40
(d) 14 : 21 : 33

GENERAL INTELLIGENCE & REASONING

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

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

(a) UUX
(b) VUY
(c) KJN
(d) CBF

Q52. 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.)

(25, 21, 38)

(43, 39, 56)

(a) (26, 22, 39)
(b) (39, 35, 18)
(c) (32, 36, 53)
(d) (9, 5, 24)

Q53. What should come in place of the question mark (?) in the given series?

17 24 38 59 87 ?

(a) 121
(b) 123
(c) 122
(d) 120

Q54. Kavya ranked 32nd from the top and 15th from the bottom in her class. How many students are there in the class?

(a) 40
(b) 46
(c) 35
(d) 36

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Q55. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

CKT60, GMS54, KOR48, ?

(a) PQR41
(b) OQQ42
(c) ORQ42
(d) PRR41

Q56. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

LAKE - ALKE - EKAL

UGLY - GULY - YLGU

(a) SINK - ISNK - KNIS
(b) PLAY - PALY - YALP
(c) RUNS - URNS - UNSR
(d) MEAT - EMAT - TEAM

Q57. Refer to the number series given below and answer the question that follows. Counting to be done from left to right only.

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

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

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

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

Q58. Seven boxes, M, N, O, P, Q, R and S, are kept one over the other, but not necessarily in the same order. Only three boxes are kept below N. Only two boxes are kept between N and P. Only Q is kept above O. S is kept ata some place below R and at some place above M. Which box is kept at the second position from the bottom?

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

Q59. Town K is to the east of Town L. Town M is to the south of Town K. Town N is to the west of Town M. Town O is to the north of Town N. Town L is to the north-west of Town O. What is the position of Town K with respect to Town O?

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

Q60. Mr. Akai starts from Point A and drives 16 km towards the north. He then takes a left turn, drives 14 km, turns left and drives 19 km. He then takes a left turn and drives 30 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) 16 km to the east
(b) 12 km to the north
(c) 16 km to the west
(d) 20 km to the south

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Q61. Refer to the following series and answer the question that follows. Counting to be done from left to right only. (All numbers are single-digit numbers only.)

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

How many even numbers are there (from left to right) which are immediately followed by odd numbers?

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

Q62. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north.

Only one person sits to the left of E. Only two people sit between E and F. C sits immediately to the right of D. G sits immediately to the left of A. Only one person sits between F and D. How many people sit between A and E?

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

Q63. Each of the digits in the number 3412687 is arranged in ascending order from left to right. What will be the sum of the digits which are second from the left and second from the right in the new number thus formed?

(a) 6
(b) 11
(c) 9
(d) 8

Q64. What should come in place of the question mark (?) in the given series?

42 55 68 81 94 ?

(a) 125
(b) 105
(c) 95
(d) 107

Q65. If 1 is added to each even digit and 2 is subtracted from each odd digit in the number 7362984, what will be the sum of the digits which are second from the left and second from the right in the new number thus formed?

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

Q66. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only.

(Left) 7 $ 5 @ 3 ! 3 5 6 7 & % $ 3 # 2 7 + ? > < (Right)

If all the numbers are dropped from the series, which of the following will be the seventh from the right?

(a) #
(b) @
(c) %
(d) $

Q67. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

BJR 18 CKS 20 DLT 22 EMU 24 ?

(a) GPV 26
(b) GOY 26
(c) FNV 26
(d) FOW 26

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

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

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

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

Q69. In a certain code language,

A ? B means ‘A is the daughter of B’,

A = B means ‘A is the son of B’,

A @ B means ‘A is the father of B’ and

A √B means ‘A is the sister of B’.

How is C related to L if 'C √D ? E @ F = L'?

(a) Daughter
(b) Sister
(c) Wife
(d) Mother

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

8 10 7 12 ‘?’ 16

(a) 10
(b) 4
(c) 11
(d) 5

Q71. In a certain code language, ‘hold it together’ is coded as ‘gt df za’ and ‘do it together’ is coded as ‘kl df za’. How is ‘hold’ coded in the given language?

(All codes are two-letter codes)

(a) gt
(b) za
(c) df
(d) kl

Q72. O, P, Q, R, W, X and Y are sitting in a straight line, facing north.

Only three people sit to the left of P. Only R sits to the right of Q. Only three people sit between Q and O. X sits at some place to the left of Y but at some place to the right of W.

How many people sit between W and Y?

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

Q73. 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) XO – UA
(b) WN – TZ
(c) VM – SY
(d) PG – NS

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Q74. HO 2 is related to IJ −12 in a certain way. In the same way, FI 5 is related to GD −9. To which of the given options is HU 3 related, following the same logic?

(a) JP −13
(b) JQ −13
(c) IQ −11
(d) IP −11

Q75. Select the pair that follows the same pattern as the one followed by the two pairs given below. Both pairs follow the same pattern.

OSO−SWS

IMI−MQM

(a) QUQ−UYU
(b) QTO−TXT
(c) QUQ−TYT
(d) QTO−UYU

Q76. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some fruits are vegetables.

All vegetables are animals.

Conclusions:

(I): Some animals are fruits.

(II): Some fruits are not animals.

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

Q77. In a certain code language, ‘star bag magic’ is coded as ‘bk kk sm’ and ‘wheat star poem’ is coded as ‘kk tj ew’. How is ‘star’ coded in that language?

(a) kk
(b) tj
(c) sm
(d) bk

Q78. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some Robins are Penguins.

All Penguins are Magpies.

All Magpies are Eagles.

Conclusions:

(I): All Penguins are Eagles.

(II): Some Magpies are Robins.

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

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Q79. O, P, Q, R, W, X, and Y are sitting in a straight line facing the north. Only three people sit between W and Y. P sits to the immediate left of Y. No one sits to the right of Q. Only two people sit between Q and P. X sits to the immediate right of O.

How many people sit between R and X?

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

Q80. Each of the digits in the number 2716495 is arranged in ascending order from left to right. What will be the sum of the digits that are first from the left and first from the right in the new number thus formed?

(a) 7
(b) 9
(c) 12
(d) 10

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Which of the following organisations launched the 'Digital Taxpayer Interface System' (DTIS) in 2025 to ease income tax filing?

(a) NITI Aayog
(b) Reserve Bank of India
(c) GST Council
(d) Central Board of Direct Taxes (CBDT)

Q82. In 2025, which nation announced its withdrawal from the Economic Community of Central African States (ECCAS)?

(a) Gabon
(b) Cameroon
(c) Burundi
(d) Rwanda

Q83. Which of the following portals integrated multiple agriculture schemes across ministries in June 2025?

(a) Krishi Nivesh
(b) FarmOne
(c) Kisan Setu
(d) AgriConnect

Q84. During the Asian Productivity Organization’s May 2025 meeting, what leadership role did India assume?

(a) Announced relocation of secretariat to New Delhi
(b) Chairmanship for 2025–26
(c) Elected as Secretary-General
(d) Vice-Chair for 2025–26

Q85. Which of the following government schemes was launched to strengthen India’s ecosystem for manufacturing electronic components, modules, and sub-assemblies?

(a) Make in India Initiative
(b) Digital India Programme
(c) Production Linked Incentive (PLI) Scheme
(d) Electronics Component Manufacturing Scheme

Q86. On 16 May 2025, the Supreme Court struck down government provisions that allowed what type of environmental clearance?

(a) Hastily approved clearances
(b) Fast-track clearances
(c) Retrospective environmental clearances

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(d) Clearances for small-scale projects

Q87. What is the name of the scheme announced in Union Budget 2025–26 for promoting Indian language books in digital form?

(a) Bharatiya Bhasha Pustak Scheme
(b) Digital Bharat Granth Scheme
(c) Vidya Vani Project
(d) Bhasha Shiksha Abhiyan

Q88. The World Social Summit (Second Summit for Social Development) was scheduled for 4–6 November 2025 in:

(a) Geneva, Switzerland
(b) Nairobi, Kenya
(c) Doha, Qatar
(d) New York, USA

Q89. Which of the following reports, released in October 2025, stated that human-caused PM2.5 pollution was responsible for more than 1.7 million deaths in India in 2022?

(a) The UNEP Global Assessment Report on Air Pollution and Health
(b) The Lancet Countdown on Health and Climate Change
(c) The World Health Organization Air Quality Assessment Report, 2025
(d) India State of Environment and Health Overview Report, 2025

Q90. As reported in February 2025, the Union Environment Ministry of Government of India developed new features on which platform for quicker processing of forest clearances?

(a) Ecosia 2.0
(b) PARIVARTAN 2.0
(c) SAMARPAN 2.0
(d) PARIVESH 2.0

Q91. What is the full form of ICC in the context of cricket?

(a) International Council for Cricket
(b) International Cricket Council
(c) International Cricket Confederation
(d) Indian Cricket Council

Q92. Which coach received the Dronacharya Award for shooting in 2025?

(a) Sandeep Sangwan
(b) Deepali Deshpande
(c) S Muralidharan
(d) Subhash Rana

Q93. In November 2025, Narendra Modi inaugurated 'Shanti Shikhar', a modern centre for spiritual learning, peace, and meditation of the Brahma Kumaris at Nava Raipur in which Indian state?

(a) Odisha
(b) Chhattisgarh
(c) Jharkhand
(d) Madhya Pradesh

Q94. On 21 May 2025, the Indian Navy officially inducted a uniquely constructed Ancient Stitched Ship at Karwar Naval Base. Which IIT is the technical partner for this?

(a) IIT Hyderabad
(b) IIT Kharagpur
(c) IIT Madras
(d) IIT Kanpur

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Q95. In June 2025, what was the Reserve Bank of India's (RBI) forecast for the average Consumer Price Index (CPI) inflation for FY26?

(a) 3.7%
(b) 3.5%
(c) 3.1%
(d) 4.1%

Q96. Who inaugurated the Fit India Carnival, 2025?

(a) Amit Shah
(b) Anurag Thakur
(c) Narendra Modi
(d) Mansukh Mandaviya

Q97. Which of the following cities of India established a Public-Private Partnership (PPP) model-based green waste processing plant under the Swachh Bharat Mission-Urban that started the first batch of trial production in March 2025?

(a) Chennai
(b) Mysore
(c) Chandigarh
(d) Indore

Q98. Under the scheme ADITI (Acing Development of Innovative Technologies), announced at DefConnect 2024, which of the following is the size of the corpus to promote innovation in defence technologies?

(a) Rs. 1,000 crore
(b) Rs. 250 crore
(c) Rs. 750 crore
(d) Rs. 500 crore

Q99. Who won the Men’s Singles title at the Australian Open 2025?

(a) Novak Djokovic
(b) Alexander Zverev
(c) Jannik Sinner
(d) Carlos Alcaraz

Q100. Which of the following major health issues is Puducherry targeting in 2025 through its new screening initiative under the Family Adoption Programme?

(a) Dengue
(b) Diabetes
(c) Malaria
(d) Tuberculosis

ANSWER KEY

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

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91 b	92 b	93 b	94 c	95 a	96 d	97 d	98 c	99 c	100 d

SOLUTIONS

Q1. Answer: (d) It retraces its own path.

The correct answer is It retraces its own path..

Key Points

• Light rays passing through the center of curvature: When a light ray passes through the center of curvature of a convex mirror, it is reflected back along the same path. This is due to the fact that the center of curvature lies on the normal to the mirror's surface, making the angle of incidence and reflection equal to zero.

• Law of Reflection: The phenomenon is explained by the Law of Reflection, which states that the angle of incidence equals the angle of reflection. Since the ray strikes the mirror perpendicularly at the center of curvature, it retraces its path.

• Convex mirror properties: A convex mirror always diverges light rays. However, when a ray passes through the center of curvature, it behaves as if the mirror is locally flat at that point, leading to the retracing of the light ray.

• Geometrical optics principle: The center of curvature is a specific point on the principal axis equidistant from all points on the mirror's surface. This symmetry ensures that any ray passing through it reflects directly back.

• Hence, the correct answer is It retraces its own path.

Additional Information

• Convex Mirror:

• A convex mirror is a spherical mirror with the reflecting surface bulging outward.

• It is also known as a diverging mirror because it causes light rays to spread out after reflection.

• Convex mirrors are commonly used as rearview mirrors in vehicles due to their wide field of view.

• Center of Curvature:

• The center of curvature is the center of the sphere from which the mirror is a part.

• It lies outside the mirror for both convex and concave mirrors.

• For a convex mirror, the center of curvature is on the side opposite to the reflecting surface.

• Focal Point and Principal Axis:

• The focal point of a convex mirror is the point where reflected rays appear to diverge from. It is located on the principal axis between the mirror and the center of curvature.

• The principal axis is an imaginary line passing through the center of curvature and the pole of the mirror.

• Applications of Convex Mirrors:

• Used in rearview mirrors of vehicles to provide a wider field of view.

• Installed in corridors, parking lots, and blind spots for surveillance and safety purposes.

• Employed in optical devices like telescopes to correct image distortions.

Important Points

• Difference between Convex and Concave Mirrors:

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

• In contrast, a concave mirror can form real or virtual images depending on the object's position relative to the focal point and center of curvature.

• Reflection from a Plane Surface:

• When light reflects off a plane mirror, it follows the same fundamental law of reflection as for curved mirrors.

• However, in curved mirrors like convex mirrors, the curvature affects the direction of reflected rays.

Q2. Answer: (b) 2.08 × 10^5 J

The correct answer is 2.08 × 10^5 J.

Key Points

• Kinetic energy formula: The kinetic energy (KE) of a moving object is given by the formula: KE = 0.5 × m × v², where m is the mass of the object, and v is its velocity in meters per second (m/s).

• Mass of the car: The given mass of the car is 1500 kg.

• Velocity conversion: The car's velocity is given as 60 km/hr. To convert it to m/s:

1 km/hr = 5/18 m/s. Therefore,

60 km/hr = (60 × 5/18) = 16.67 m/s.

• Calculation of kinetic energy: Substituting the values in the formula:

KE = 0.5 × 1500 × (16.67)² = 0.5 × 1500 × 278 = 2,08,500 J. This is approximately equal to 2.08 × 10^5 J.

• Work-energy principle: The minimum work required to stop the car is equal to its initial kinetic energy, which is 2.08 × 10^5 J.

Additional Information

• Work-Energy Theorem: The work-energy theorem states that the work done on an object is equal to the change in its kinetic energy. In this case, the car is brought to rest, so all its initial kinetic energy is dissipated through work (e.g., friction).

• Energy dissipation: When a car comes to rest, the kinetic energy is converted into other forms of energy like heat due to friction between the brakes and wheels, or sound energy.

• Importance of brakes: Car brakes are designed to perform this work efficiently by applying force to bring the vehicle to rest within a safe distance. The energy dissipation capacity of brakes is a critical safety feature.

• SI Unit of energy: The SI unit of energy is the joule (J). One joule is the energy transferred when a force of one newton acts over a displacement of one meter.

• Practical example: The calculated energy (2.08 × 10^5 J) is a significant amount of energy. It shows why brakes and safety mechanisms in vehicles must be robust to handle such energy dissipation.

Important Points

• Velocity and kinetic energy relationship: Kinetic energy is proportional to the square of velocity. This means that doubling the velocity of an object increases its kinetic energy by four times.

• Real-world implications: High-speed vehicles require significantly more energy to stop due to their higher kinetic energy. This is why speed limits and safe driving practices are emphasized.

• Braking distance: The braking distance of a vehicle depends on its initial velocity, mass, road conditions, and braking efficiency. The energy dissipated during braking determines the stopping distance.

• Energy conservation: The concept of energy conservation is crucial in understanding how energy transforms from one form to another (kinetic to heat, sound, etc.) during processes like braking.

Q3. Answer: (c) 40

The correct answer is 40.

Key Points

• Magnesium Oxide (MgO) is a compound consisting of magnesium (Mg) and oxygen (O).

• The atomic mass of magnesium is 24.305 u, and the atomic mass of oxygen is 15.999 u.

• The molecular mass of magnesium oxide is calculated as:

Molecular Mass = Atomic Mass of Mg + Atomic Mass of O = 24.305 u + 15.999 u = 40.304 u.

• For simplicity and standardization in most cases, the molecular mass is rounded to 40 u.

• Magnesium oxide is a white, crystalline solid and is commonly used in industries like medicine, construction, and as a refractory material.

Additional Information

• Magnesium (Mg):

• Magnesium is a chemical element with the atomic number 12.

• It is an alkaline earth metal, lightweight, and silvery-white in appearance.

• Magnesium is highly reactive in nature and is widely used in alloys, batteries, and fertilizers.

• Oxygen (O):

• Oxygen is a chemical element with the atomic number 8.

• It is a highly reactive non-metal and is essential for the survival of most life forms on Earth.

• Oxygen forms compounds with almost all other elements, including magnesium, to produce magnesium oxide.

• Properties of Magnesium Oxide:

• Magnesium oxide is a basic oxide and reacts with acids to form magnesium salts.

• It has a high melting point (around 2852°C) and is often used as a refractory material.

• It is widely used in the medical field as an antacid to neutralize stomach acid and as a laxative.

• Applications of Magnesium Oxide:

• Used in the construction industry as a fireproof and lightweight material.

• Commonly employed in the manufacture of ceramics due to its high-temperature stability.

• Used in the food and pharmaceutical industries as a supplement and antacid.

Important Points

• Atomic Mass: The atomic mass is the weighted average mass of the atoms in a naturally occurring element, measured in atomic mass units (u).

• Molecular Mass: The molecular mass is the sum of the atomic masses of all the atoms in a molecule.

• Magnesium oxide's composition is 1:1 for magnesium and oxygen atoms, making it a simple binary compound.

• It is a stable compound and does not decompose easily under normal conditions.

• Magnesium oxide is also used in laboratories as a reference material for calibrating analytical instruments.

Q4. Answer: (d) The object is placed between the pole and the focus of the mirror.

The correct answer is The object is placed between the pole and the focus of the mirror.

Key Points

• A concave mirror can form different types of images depending on the position of the object.

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

• This phenomenon occurs because the reflected rays appear to diverge and meet behind the mirror, creating a virtual image.

• The enlarged virtual image is seen on the same side of the mirror as the object.

• Example: This property of concave mirrors is used in applications like makeup mirrors and dentist's mirrors to provide a magnified view.

Additional Information

• Concave Mirror:

• A concave mirror is a spherical mirror that has a reflecting surface on the inside of the sphere.

• It is also called a converging mirror as it focuses parallel rays of light to a single point known as the focus.

• Applications of concave mirrors include telescopes, headlights, and shaving mirrors.

• Image Characteristics Based on Object Placement:

• If the object is placed at infinity, the image is formed at the focus (F), and it is real, inverted, and highly diminished.

• When the object is placed beyond the center of curvature (C), the image is formed between C and F, and it is real, inverted, and diminished.

• If the object is placed at the center of curvature (C), the image is formed at C, and it is real, inverted, and of the same size as the object.

• When the object is placed between C and F, the image is formed beyond C, and it is real, inverted, and magnified.

• When the object is placed at the focus (F), the image is formed at infinity, and it is real, inverted, and highly magnified.

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

• Key Terms:

• Focus (F): The point where parallel rays of light converge after reflection from a concave mirror.

• Center of Curvature (C): The center of the sphere from which the mirror is a part.

• Pole (P): The geometric center of the mirror's surface.

• Principal Axis: The straight line passing through the pole and the center of curvature.

• Applications of Virtual and Magnified Images:

• Makeup Mirrors: Concave mirrors are used to magnify facial features for better visibility while applying makeup.

• Dentistry: Dentists use concave mirrors to get an enlarged and clear view of a patient's teeth.

• Ophthalmology: Used in diagnostic tools to examine the human eye.

Important Points

• Real Images: Formed when light rays actually converge and meet after reflection; they are always inverted.

• Virtual Images: Formed when light rays appear to diverge from a point behind the mirror; they are always erect.

• Magnification: The degree to which the image size is larger or smaller than the object size, denoted by the formula M = -v/u, where v is the image distance and u is the object distance.

• Mirror Formula: The relationship between object distance (u), image distance (v), and focal length (f) is given by 1/f = 1/v + 1/u.

Q5. Answer: (b) 16 u

The correct answer is 16 u.

Key Points

• Atomic Mass: The atomic mass of an element is defined as the mass of its atom expressed in atomic mass units (u). For oxygen, the atomic mass is 16 u.

• Oxygen's Isotope: The most abundant isotope of oxygen is Oxygen-16, which has 8 protons and 8 neutrons, resulting in an atomic mass of 16 u.

• Periodic Table: Oxygen is represented by the symbol O in the periodic table and is located in Group 16 (Chalcogens) and Period 2.

• Significance: The atomic mass is crucial for chemical calculations, including determining the molar mass of compounds that

include oxygen.

• Incorrect Options: 18 u refers to the molecular mass of water (H2O), 8 u is incorrect as it only accounts for protons, and 12 u corresponds to the atomic mass of carbon.

Additional Information

• Isotopes of Oxygen: Oxygen exists in three isotopes: Oxygen-16, Oxygen-17, and Oxygen-18. Among these, Oxygen-16 is the most abundant, comprising over 99.76% of naturally occurring oxygen.

• Properties: Oxygen is a highly reactive non-metal and is essential for life. It is the most abundant element in the Earth's crust and atmosphere.

• Applications: Oxygen is widely used in industries such as steel production, medical oxygen therapy, and water treatment. It is also vital for combustion processes.

• Molecular Oxygen: Oxygen commonly exists as a diatomic molecule (O2) in nature. The molecular mass of oxygen gas is 32 u (16 u × 2).

• Discovery: Oxygen was discovered by Carl Wilhelm Scheele in 1772 and independently by Joseph Priestley in 1774. The name "oxygen" was coined by Antoine Lavoisier, who demonstrated its role in combustion and respiration.

Important Points

• Atomic Mass Unit (u): An atomic mass unit is defined as one-twelfth the mass of a carbon-12 atom. It is approximately 1.66 × 10^-²^7 kg.

• Periodic Table Context: Oxygen is the eighth element in the periodic table, with an atomic number of 8, representing its number of protons.

• Role in Compounds: Oxygen forms numerous compounds, including oxides, acids, and organic molecules. It is part of water (H2O), which is essential for all forms of life.

• Reactivity: Oxygen readily forms bonds with other elements due to its high electronegativity (3.44 on the Pauling scale).

• Environmental Impact: Oxygen is critical for maintaining life on Earth and is involved in processes such as photosynthesis and respiration. However, excessive oxygen in water bodies can lead to issues like eutrophication.

Q6. Answer: (b) Papaya

The correct answer is Papaya.

Key Points

• Unisexual plants have flowers that contain either male (stamens) or female (carpels) reproductive organs, but not both.

• Papaya is a classic example of a unisexual plant, as its male and female flowers are found on separate plants. Hence, it is dioecious.

• China rose and Mustard are bisexual plants, as their flowers contain both male and female reproductive parts. Hence, they are not unisexual.

• Pea is also a bisexual plant, as its flowers have both stamens and pistils. Thus, it is not unisexual.

• Unisexual plants like Papaya are essential in studying plant reproduction, as they require cross-pollination for fertilization, which promotes genetic diversity.

Additional Information

• Characteristics of Unisexual Plants:

• Unisexual plants bear flowers that are either male or female, but not both.

• Examples include Papaya, Watermelon, and Cucumber.

• These plants often rely on external agents like wind, water, or animals for pollination.

• Characteristics of Bisexual Plants:

• Bisexual plants have flowers with both stamens (male reproductive organ) and pistils (female reproductive organ).

• Examples include China rose, Mustard, and Pea.

• Self-pollination is possible in bisexual plants, although cross-pollination can also occur.

• Pollination in Unisexual Plants:

• Unisexual plants depend on external pollination mechanisms for fertilization, as they lack both reproductive organs in one flower.

• Cross-pollination enhances genetic diversity, which can improve the adaptability of the plant species.

• Examples of Dioecious Plants:

• In dioecious plants like Papaya, male and female flowers are found on separate plants.

• Other examples of dioecious plants include Date palm and Willow.

Important Points

• Flower Terminology:

• A flower is termed unisexual if it has only stamens (male) or pistils (female).

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• A flower is termed bisexual if it has both stamens and pistils.

• Reproductive Strategies:

• Unisexual plants promote cross-pollination, which improves the gene pool of the species.

• Bisexual plants can self-pollinate but also rely on cross-pollination for better genetic variation.

Q7. Answer: (b) 16 V

The correct answer is 16 V.

Key Points

• The problem involves calculating the potential difference (V) across a resistor using the given data of heat produced and resistance.

• The relationship between heat, current, and resistance is derived from the formula for power dissipation: $P = I^2R$, where P is power, I is current, and R is resistance.

• Given that the resistor produces 64 J of heat every second, this indicates that the power (P) is 64 W (since power is energy per unit time).

• To find the current (I), use the formula: $P = I^2R$. Rearranging gives: $I = \sqrt{(P/R)}$. Substituting the values:

$I = \sqrt{(64/4)} = \sqrt{16} = 4$ A.

• Next, use Ohm's Law: $V = IR$, to calculate the potential difference. Substituting the values:

$V = 4 \times 4 = 16$ V.

• Hence, the correct answer is 16 V.

Additional Information

• Ohm's Law:

• Ohm's Law states that the current (I) through a conductor between two points is directly proportional to the voltage (V) across the two points and inversely proportional to the resistance (R).

• The mathematical expression is: $V = IR$.

• This law is fundamental in circuit analysis and is used to calculate voltage, current, or resistance in electrical circuits.

• Power in Electrical Circuits:

• Electrical power is the rate at which electrical energy is transferred by an electric circuit. It is measured in watts (W).

• The formula for power is: $P = V \times I$, where P is power, V is voltage, and I is current.

• Alternatively, using Ohm's Law, power can also be expressed as: $P = I^2R$ or $P = V^2/R$.

• Resistance:

• Resistance is a measure of the opposition to the flow of electric current in a circuit. It is measured in ohms (Ω).

• Factors affecting resistance include the material, length, and cross-sectional area of the conductor, as well as temperature.

• Resistors are components specifically designed to provide a certain amount of resistance in electrical circuits.

• Heat Produced by a Resistor:

• When current flows through a resistor, electrical energy is converted into heat energy. This phenomenon is described by Joule's Law of Heating.

• The heat produced is directly proportional to the square of the current, the resistance, and the time for which the current flows: $H = I^2Rt$.

Important Points

• Unit of Power: The unit of power is watt (W), where 1 watt equals 1 joule per second.

• Unit of Resistance: The unit of resistance is ohm (Ω), named after the German physicist Georg Simon Ohm.

• Practical Applications: Understanding these concepts is essential for designing electrical appliances, power systems, and electronic devices.

• Safety Note: Excessive heat generated by resistors can damage circuits, so proper heat dissipation mechanisms, such as heat sinks or fans, are often employed.

Q8. Answer: (c) 1-2 days

The correct answer is 1-2 days.

Key Points

• In human females, after ovulation, the egg remains viable for fertilization for a period of 24 to 48 hours (1-2 days).

• The egg is released from the ovary and travels to the fallopian tube, where it waits for sperm for fertilization.

• If fertilization does not occur within this period, the egg degenerates and is absorbed by the body. Hence, the correct option is 1-2 days.

• This limited viability is one of the key reasons why the timing of intercourse or artificial insemination is crucial for successful

conception.

• The lifespan of the egg is significantly shorter compared to sperm, which can survive in the female reproductive tract for up to 5 days under optimal conditions.

Additional Information

• Ovulation Process:

• Ovulation occurs mid-cycle, approximately on the 14th day of a typical 28-day menstrual cycle.

• The process is triggered by a surge in Luteinizing Hormone (LH) secreted by the pituitary gland.

• The released egg is encased within a structure called the corona radiata and is pushed into the fallopian tube by the fimbriae of the ovary.

• Role of Fallopian Tubes:

• The fallopian tubes are essential for transporting the egg from the ovary to the uterus.

• They are the site of fertilization, where the sperm meets the egg to form a zygote.

• Any blockage or damage to the fallopian tubes can lead to infertility.

• Fertilization Window:

• The fertile window typically spans 5-6 days, including the day of ovulation and the days leading up to it.

• During this time, sexual intercourse or insemination has the highest probability of leading to pregnancy.

• Hormonal Regulation:

• The menstrual cycle is regulated by hormones such as FSH (Follicle Stimulating Hormone), LH (Luteinizing Hormone), Estrogen, and Progesterone.

• These hormones ensure the maturation of the egg, its release, and preparation of the uterine lining for implantation.

• Comparison of Sperm and Egg Lifespan:

• While the egg's lifespan is limited to 1-2 days, sperm can survive for up to 5 days in the female reproductive tract under favorable conditions.

• This difference in viability highlights the importance of timing in conception.

Important Points

• Menstrual Cycle Phases:

• The menstrual cycle has four phases: menstrual phase, follicular phase, ovulation phase, and luteal phase.

• Ovulation is a critical phase for reproduction, occurring around the midpoint of the cycle.

• Factors Affecting Egg Viability:

• Age plays a significant role, as egg quality declines with age, particularly after 35 years.

• Hormonal imbalances and lifestyle factors like stress, diet, and smoking can impact fertility.

• Assisted Reproductive Technologies (ART):

• Techniques like IVF (In Vitro Fertilization) and IUI (Intrauterine Insemination) help couples with conception challenges.

• In IVF, eggs are fertilized outside the body and then implanted into the uterus.

• Egg Freezing:

• Egg freezing allows women to preserve their fertility for future use, especially if they plan to delay pregnancy.

• The frozen eggs can later be thawed, fertilized, and implanted as part of ART procedures.

Q9. Answer: (c) Sclerenchyma

The correct answer is Sclerenchyma.

Key Points

• Sclerenchyma is a type of plant tissue that provides mechanical support to the plant and makes it hard and stiff. It is the main strengthening tissue in plants.

• The cells of sclerenchyma are characterized by their thickened, lignified cell walls, which provide rigidity and durability.

• Sclerenchyma cells are typically dead at maturity. They lack protoplasm, making them well-suited to their role as a support structure.

• There are two types of sclerenchyma cells: fibers (elongated cells) and sclereids (short, irregularly shaped cells). Both contribute to the hardness of plant parts, such as seed coats, nutshells, and vascular bundles.

• Common examples of sclerenchyma include coconut husk fibers and the gritty texture in guava or pear, which is due to sclereids.

Additional Information

• Collenchyma:

• Collenchyma cells have unevenly thickened cell walls, primarily composed of cellulose and pectin.

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• This tissue provides flexibility and mechanical support to growing parts of the plant, such as stems and leaves.
• Unlike sclerenchyma, collenchyma cells are living at maturity and have a protoplasm.
• Aerenchyma:
• Aerenchyma is a specialized parenchyma tissue with large air spaces that facilitate gas exchange and buoyancy in aquatic plants.
• It is commonly found in plants like water hyacinth and lotus, where it helps the plant to float.
• Chlorenchyma:
• Chlorenchyma cells contain abundant chloroplasts and are involved in photosynthesis.
• This tissue is present in the mesophyll of leaves and other green parts of plants.
• Chlorenchyma contributes to the production of food in plants through the process of photosynthesis.
• Sclerenchyma Characteristics:
• Location: Found in stems, roots, vascular bundles, and hard parts like seed coats and nutshells.
• Function: Provides rigidity, durability, and mechanical strength to the plant.
• Examples: Coconut husk fibers, sclereids in pears, and the hard shell of nuts.

Important Points

• Key Differences Between Sclerenchyma and Collenchyma:
• Sclerenchyma cells are dead at maturity, while collenchyma cells are living.
• Sclerenchyma has thick lignified walls, whereas collenchyma walls are unevenly thickened and non-lignified.
• Collenchyma provides flexibility, while sclerenchyma provides rigidity.
• Applications of Sclerenchyma:
• Used in rope-making due to the fibers' strength (e.g., jute and hemp).
• Provides structural support in wood and bamboo industries.

Q10. Answer: (c) give birth to an underweight baby

The correct answer is give birth to an underweight baby.

Key Points

• A malnourished mother during pregnancy lacks essential nutrients such as proteins, vitamins, and minerals, which are crucial for the growth and development of the fetus.
• Malnutrition can lead to intrauterine growth restriction (IUGR), resulting in the birth of an underweight baby (weighing less than 2.5 kg).
• Underweight babies are at a higher risk of developing health issues such as weakened immunity, developmental delays, and chronic illnesses later in life.
• Prenatal malnutrition affects the placental function, reducing the supply of oxygen and nutrients to the fetus, which directly impacts fetal weight and growth.
• Hence, ensuring a balanced diet and proper prenatal care is critical for the health of both the mother and the baby.

Additional Information

• Role of Nutrition in Pregnancy:
• A balanced diet rich in iron, calcium, folic acid, and proteins is essential for fetal development.
• Iron deficiency in pregnant women can lead to anemia and low birth weight in babies.
• Folic acid prevents neural tube defects in the fetus.
• Impact of Low Birth Weight:
• Babies with low birth weight are more prone to infections due to a weaker immune system.
• They may face difficulty in feeding, maintaining body temperature, and gaining weight.
• Global Statistics on Maternal Malnutrition:
• According to the World Health Organization (WHO), approximately 20 million babies are born with low birth weight annually, primarily in developing countries.
• Maternal malnutrition is a significant contributor to this issue, especially in low-income regions.
• Preventive Measures:
• Antenatal care programs can help monitor maternal health and provide nutritional supplements.
• Fortification of staple foods and public health campaigns can address dietary deficiencies in pregnant women.

Important Points

• Comparison of Options:
• Option 1 - Have a stronger immune system: Malnutrition weakens the immune system instead of strengthening it. This is

incorrect.

• Option 2 - Have a faster delivery: Malnutrition does not directly cause faster delivery. Preterm birth may occur in malnourished mothers, but it is not equivalent to faster delivery. This is incorrect.

• Option 3 - Give birth to an underweight baby: This is the most accurate option as maternal malnutrition is directly linked to low birth weight. This is correct.

• Option 4 - Produce more milk: Malnutrition reduces the mother's capacity to produce sufficient milk for the newborn. This is incorrect.

• Government Initiatives in India:

• The Integrated Child Development Services (ICDS) scheme provides supplementary nutrition to pregnant and lactating mothers.

• Janani Suraksha Yojana (JSY) encourages institutional deliveries to ensure better maternal and child care.

• The National Iron Plus Initiative aims to combat anemia in pregnant women through iron and folic acid supplementation.

Q11. Answer: (c) Nitrogen

The correct answer is Nitrogen.

Key Points

• Nitrogen is a preferred gas for flushing packaged food items to prevent rancidity. This is because it is an inert gas that does not react with the food or its oils.

• Rancidity occurs when oxygen reacts with oils and fats in food, leading to the formation of unpleasant odors and flavors. Flushing with nitrogen displaces oxygen, thus preventing this reaction.

• Nitrogen flushing is widely used in the food industry for products like potato chips, snacks, and coffee to maintain freshness and extend shelf life.

• Unlike gases such as oxygen or carbon dioxide, nitrogen does not support the growth of bacteria or fungi, making it ideal for food preservation.

• Additionally, nitrogen is non-toxic, non-flammable, and readily available, making it a cost-effective and safe choice for food packaging.

Additional Information

• Rancidity:

• It is a chemical process in which fats and oils in food oxidize, leading to unpleasant odors, flavors, and discoloration.

• Two major types of rancidity are oxidative rancidity (caused by oxygen) and hydrolytic rancidity (caused by water or enzymes).

• Oxidative rancidity is the primary concern in packaged foods, which is why oxygen needs to be removed.

• Properties of Nitrogen:

• Chemical Inertness: Nitrogen is chemically stable and does not react easily with food components.

• Abundance: Nitrogen makes up approximately 78% of Earth's atmosphere, making it easily accessible.

• Non-Toxic: It is safe for food applications as it does not pose any health risks when ingested in trace amounts.

• Other Gases and Their Roles:

• Nitric Oxide (NO): A reactive gas used in industrial applications but not suitable for food preservation due to its reactivity.

• Nitrogen Dioxide (NO_2): A toxic and reactive gas, making it unsuitable for food packaging.

• Dinitrogen Trioxide (N_2O_3): An unstable compound that decomposes easily and is not used for food preservation.

• Applications of Nitrogen in Food Industry:

• Modified Atmosphere Packaging (MAP): Nitrogen is used to replace oxygen in food packaging to extend shelf life.

• Snack Foods: Nitrogen flushing is common in packaging chips and other snacks to prevent them from becoming stale.

• Powdered Products: Coffee and milk powders are often packed using nitrogen to retain flavor and aroma.

Important Points

• Preservation Techniques:

• Other preservation methods include vacuum sealing, refrigeration, and adding antioxidants to food.

• However, nitrogen flushing is particularly effective for dry, packaged products.

• Global Standards:

• Food-grade nitrogen is regulated by organizations like the Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA).

• It must meet specific purity criteria to ensure it is safe for use in food applications.

Q12. Answer: (c) Peripheral nervous system

The correct answer is Peripheral nervous system.

Key Points

• The Peripheral Nervous System (PNS) serves as the communication network between the Central Nervous System (CNS), comprising the brain and spinal cord, and the rest of the body.

• It is responsible for transmitting sensory inputs from various parts of the body to the CNS and relaying motor commands from the CNS to the muscles and glands for action.

• The PNS is divided into two primary components: Somatic Nervous System (controls voluntary movements) and Autonomic Nervous System (regulates involuntary functions like heart rate and digestion).

• Cranial nerves and spinal nerves, which are part of the PNS, connect the CNS to the limbs, organs, and external environment.

• It plays a crucial role in enabling reflex actions, sensory perception, and motor coordination, ensuring smooth functioning of the body.

Additional Information

• Central Nervous System (CNS):

• The CNS includes the brain and spinal cord, which are responsible for processing sensory information, making decisions, and controlling body movements.

• The brain is the command center, while the spinal cord acts as the conduit for transmitting signals to and from the PNS.

• It is protected by the skull and vertebral column, as well as layers of meninges and cerebrospinal fluid.

• Somatic Nervous System:

• Part of the PNS that controls voluntary movements of skeletal muscles.

• It enables conscious activities such as walking, running, and grabbing objects.

• It includes afferent nerves (sensory) and efferent nerves (motor) to regulate interaction with the external environment.

• Autonomic Nervous System:

• Another division of the PNS that regulates involuntary functions like heart rate, breathing, and digestion.

• Divided into sympathetic (activates "fight or flight" response) and parasympathetic (promotes "rest and digest" functions).

• Helps maintain homeostasis by managing internal processes automatically.

• Spinal Cord:

• The spinal cord is part of the CNS but works closely with the PNS to transmit signals.

• It is protected by the vertebral column and serves as the main communication pathway between the brain and the peripheral nerves.

• It controls reflex actions independently of the brain through reflex arcs.

• Voluntary and Involuntary Muscles:

• Voluntary muscles are controlled by the somatic nervous system and are involved in conscious movements.

• Involuntary muscles, such as smooth muscles and cardiac muscles, are regulated by the autonomic nervous system.

• Though important for body functions, they do not directly facilitate communication between the CNS and other body parts.

Important Points

• Key Functions of PNS:

• Connects the CNS to limbs and organs.

• Facilitates sensory input and motor output.

• Ensures coordination between voluntary and involuntary bodily functions.

• Cranial Nerves:

• There are 12 cranial nerves in the PNS that control sensory and motor functions in the head and neck.

• Examples include the optic nerve (vision) and vagus nerve (parasympathetic control).

• Spinal Nerves:

• 31 pairs of spinal nerves originate from the spinal cord and regulate sensory and motor functions throughout the body.

• These nerves are categorized into cervical, thoracic, lumbar, sacral, and coccygeal regions.

• Diseases Affecting the PNS:

• Peripheral neuropathy, Guillain-Barré syndrome, and nerve compression syndromes can disrupt PNS functions.

• Effective treatment relies on early diagnosis and proper intervention.

Q13. Answer: (b) Vacuoles are responsible for protein synthesis in the cell.

The correct answer is Vacuoles are responsible for protein synthesis in the cell..

Key Points

• Vacuoles are membrane-bound organelles found in the cells of plants, fungi, and some protists, as well as in animal and bacterial cells. However, their structure and function vary significantly among these organisms.

• Plant cells usually have a large central vacuole: This statement is correct. Plant cells are characterized by the presence of a

large central vacuole, which occupies most of the cell's volume. This vacuole plays a key role in maintaining cell turgor pressure, which is essential for structural support.

• Vacuoles are responsible for protein synthesis in the cell: This statement is incorrect. Protein synthesis is carried out by ribosomes, which are either free-floating in the cytoplasm or attached to the rough endoplasmic reticulum. Vacuoles do not participate in protein synthesis; their primary role is storage, waste disposal, and maintaining cellular homeostasis.

• Vacuoles in plant cells are filled with cell sap: This statement is correct. The central vacuole in plant cells contains cell sap, a solution of water, enzymes, ions, and other molecules. This helps in providing turgidity and rigidity to the plant cell.

• Vacuoles store important substances: This statement is correct. Vacuoles act as storage compartments for essential molecules such as amino acids, sugars, organic acids, and proteins, as well as waste products.

Additional Information

• Functions of Vacuoles:

• Storage: Vacuoles store nutrients, waste products, and other essential molecules. In seeds, they may store proteins required for germination.

• Structural Support: In plant cells, the large central vacuole helps maintain structural integrity by exerting turgor pressure against the cell wall.

• Waste Management: Vacuoles can store harmful substances and play a role in detoxification by isolating waste products.

• pH and Ion Balance: They regulate the internal pH of the cell and maintain ion balance by sequestering ions.

• Protein Synthesis:

• Protein synthesis occurs in ribosomes, which are composed of ribosomal RNA (rRNA) and proteins.

• Ribosomes are found either in the cytoplasm or attached to the rough endoplasmic reticulum in eukaryotic cells.

• The process involves two main stages: transcription (in the nucleus) and translation (at the ribosome).

• Comparison Between Vacuoles in Plants and Animals:

• Plant Vacuoles: Large and permanent, mainly for storage and maintaining turgor pressure.

• Animal Vacuoles: Smaller and temporary, used for storage, exocytosis, and endocytosis.

• Examples of Specialized Vacuoles:

• Contractile Vacuoles: Found in protists like Paramecium, they help in osmoregulation by expelling excess water.

• Food Vacuoles: Found in unicellular organisms like amoebae, they assist in digesting engulfed food particles.

Important Points

• Discovery: Vacuoles were first observed by Antonie van Leeuwenhoek in the late 17th century in plant cells.

• Tonoplast: The vacuole is surrounded by a specialized membrane called the tonoplast, which regulates the movement of ions and molecules in and out of the vacuole.

• Cell Sap Composition: Cell sap is primarily composed of water, inorganic ions (e.g., potassium and chloride), sugars, amino acids, and pigments such as anthocyanins.

• Role in Pigmentation: In plants, pigments stored in vacuoles (e.g., anthocyanins) contribute to the coloration of flowers and fruits, aiding in pollination and seed dispersal.

• Role in Autophagy: Vacuoles can degrade damaged organelles and cellular components, thus playing a role in cellular recycling and homeostasis.

Q14. Answer: (d) Both (i) and (iii)

The correct answer is Both (i) and (iii).

Key Points

• Density and sinking in water: An object sinks in water if its density is greater than the density of water, which is 1 g/cm³.

• Statement (i) - An iron nail of density 2.5 g/cm³: The density of the iron nail is greater than the density of water. Hence, the iron nail will sink. This statement is correct.

• Statement (ii) - An iron block of density 0.83 g/cm³: The density of the iron block is less than the density of water. Hence, the iron block will float. This statement is incorrect.

• Statement (iii) - An iron ball of density 2 g/cm³: The density of the iron ball is greater than the density of water. Hence, the iron ball will sink. This statement is correct.

• Correct combination: Both objects (i) and (iii) will sink in water as their densities are greater than 1 g/cm³.

Additional Information

• Density:

• Definition: Density is the measure of mass per unit volume, given by the formula: Density = Mass/Volume.

• Units: The SI unit of density is kg/m³, but for smaller objects, it is often expressed in g/cm³.

• Water's density: The density of water is 1 g/cm³ at standard temperature and pressure (4°C).

• Principle of floating and sinking:
• An object will sink in a fluid if its density is greater than the fluid's density.
• An object will float if its density is less than the fluid's density.
• Examples of objects sinking or floating:
• Floating objects: Wood (density around 0.6 g/cm³), cork, plastic.
• Sinking objects: Metals like iron (density ~7.8 g/cm³), steel, and lead.
• Archimedes' principle:
• An object submerged in a fluid experiences a buoyant force equal to the weight of the fluid it displaces.
• This principle explains why objects with densities lower than water float, while those with higher densities sink.

Important Points

• Density of common materials:
• Iron: ~7.8 g/cm³ (solid), but objects like blocks or hollow structures can have lower average densities due to air spaces.
• Wood: Varies from 0.4 to 0.9 g/cm³, generally floats in water.
• Plastic: Depending on the type, plastic can either float or sink (density usually ranges from 0.8 to 1.4 g/cm³).
• Factors affecting floating or sinking:
• Shape: Even dense materials like steel can float if shaped into a hollow structure (e.g., ships).
• Fluid density: Objects may float in denser fluids like saltwater but sink in less dense fluids like oil.

Q15. Answer: (c) The mitochondrial inner membrane is deeply folded.

The correct answer is The mitochondrial inner membrane is deeply folded.

Key Points

• Mitochondria are double-membraned organelles found in both plant and animal cells. They are known as the "powerhouses of the cell" because they generate energy in the form of ATP (adenosine triphosphate).
• The inner membrane of mitochondria is deeply folded into structures called cristae. These folds increase the surface area for biochemical processes such as oxidative phosphorylation, which is crucial for energy production. Hence, this statement is correct.
• Mitochondria have their own DNA, which allows them to replicate and produce some of their own proteins independently of the cell nucleus. The statement "Mitochondria does not have its own DNA" is therefore incorrect.
• Mitochondria do not perform photosynthesis. Photosynthesis occurs in chloroplasts, which are organelles specific to plant cells. Thus, the statement "Mitochondria performs photosynthesis" is incorrect.
• Mitochondria have a double membranous covering, not a single membrane. The outer membrane is smooth, while the inner membrane is folded into cristae. Hence, the statement "Mitochondria has a single membranous covering" is incorrect.

Additional Information

• Structure of Mitochondria:
• Mitochondria have two membranes: an outer membrane and an inner membrane.
• The inner membrane has folds called cristae, which are essential for increasing the surface area for metabolic activities.
• The space between the inner and outer membranes is called the intermembrane space, while the space inside the inner membrane is the matrix.
• Functions of Mitochondria:
• Energy production: Mitochondria generate ATP through the process of cellular respiration, primarily in the electron transport chain located in the cristae.
• Apoptosis: Mitochondria play a role in programmed cell death by releasing molecules like cytochrome c.
• Calcium storage: Mitochondria help regulate calcium levels in cells.
• Metabolism: They are involved in the metabolism of carbohydrates, fats, and proteins.
• Unique Features of Mitochondria:
• Mitochondria have their own DNA and ribosomes, enabling them to synthesize some of their own proteins.
• They are thought to have originated from an ancient symbiotic relationship with bacteria, as per the endosymbiotic theory.
• Comparison with Chloroplasts:
• Both mitochondria and chloroplasts have double membranes and their own DNA.
• While mitochondria are involved in energy production through cellular respiration, chloroplasts perform photosynthesis to convert light energy into chemical energy.
• Chloroplasts are exclusive to plants and algae, whereas mitochondria are found in almost all eukaryotic cells.

Important Points

• Electron Transport Chain: The ETC is located in the inner membrane of mitochondria and plays a key role in oxidative

phosphorylation, producing ATP.

• Matrix: The mitochondrial matrix contains enzymes that are crucial for the Krebs cycle, which is another step in energy production.

• Endosymbiotic Theory: The theory suggests that mitochondria evolved from free-living bacteria that entered into a symbiotic relationship with ancestral eukaryotic cells.

• Diseases: Mutations in mitochondrial DNA can lead to various disorders, such as mitochondrial myopathy and Leigh syndrome.

• Adaptations: The number of mitochondria in a cell varies depending on its energy requirements. For instance, muscle cells have a higher concentration of mitochondria.

Q16. Answer: (b) Iodine

The correct answer is Iodine.

Key Points

• Iodine is a non-metal but exhibits a metallic lustre. This is a unique characteristic among non-metals.

• The metallic lustre of iodine is due to the reflection of light by its closely packed molecules arranged in a crystalline structure.

• Iodine appears as a shiny, dark gray or purple solid, which is why it is often mistaken for a metal based on its appearance.

• Unlike metals, iodine is brittle and does not exhibit properties like ductility or malleability, affirming its classification as a non-metal.

• Iodine sublimates upon heating, transitioning directly from a solid to a purple vapor, which is a characteristic property of non-metals.

Additional Information

• Characteristics of Sulphur:

• It is a brittle yellow solid at room temperature.

• It does not exhibit metallic lustre and is classified as a non-metal.

• Commonly used in the production of sulfuric acid, fertilizers, and fireworks.

• Characteristics of Phosphorus:

• Exists in several allotropic forms, such as white, red, and black phosphorus.

• It does not exhibit metallic lustre; instead, white phosphorus is waxy and translucent, while red phosphorus is powdery.

• It is essential for biological processes and is a key component of DNA, RNA, and ATP.

• Characteristics of Nitrogen:

• Nitrogen is a colorless, odorless gas at room temperature.

• It does not exhibit metallic lustre and is found abundantly in the Earth’s atmosphere (78%).

• It plays a crucial role in the synthesis of proteins and nucleic acids in living organisms.

• Properties of Iodine:

• Iodine is a halogen and belongs to Group 17 of the periodic table.

• It is widely used in medicine as an antiseptic and in the iodization of salt to prevent iodine deficiency.

• It has a relatively high atomic number (53) among non-metals, which contributes to its metallic appearance.

Important Points

• Why Iodine Exhibits Metallic Lustre:

• The metallic appearance of iodine is due to the interaction of light with its delocalized electrons in the crystalline structure.

• This phenomenon is rare among non-metals, making iodine a unique element in terms of its physical properties.

• Applications of Iodine:

• Used in diagnostic imaging (iodine-based contrast agents).

• Essential in the production of thyroid hormones, which regulate metabolism.

• Serves as a catalyst in various chemical reactions.

Q17. Answer: (b) Because it would imply the compass needle could point in two directions simultaneously

The correct answer is Because it would imply the compass needle could point in two directions simultaneously.

Key Points

• Magnetic field lines represent the direction and strength of a magnetic field at a given point. They are conceptual tools used to visualize magnetic forces.

• Two magnetic field lines never cross each other because if they did, it would mean that at the point of intersection, there are two different directions of the magnetic field. This is physically impossible as the magnetic field at any point can have only one direction.

• If two field lines intersected, a compass needle placed at that point would have to point in two different directions simultaneously,

which is not feasible. Hence, the correct answer is that it would imply the compass needle could point in two directions simultaneously.

• Field lines are continuous curves, starting from the north pole of a magnet and ending at its south pole, without any abrupt changes or intersections.

• Magnetic field lines are non-intersecting by nature, ensuring a unique and consistent representation of the field's direction and magnitude.

Additional Information

• Magnetic Field Lines Characteristics:

• Closed Loops: Magnetic field lines form closed loops. They emerge from the north pole and enter the south pole outside the magnet, while inside the magnet, they go from the south pole to the north pole.

• Density Representation: The density of magnetic field lines indicates the strength of the field. The closer the lines, the stronger the magnetic field in that region.

• Non-Intersection: As explained above, magnetic field lines do not intersect because a unique direction of the magnetic field is required at every point.

• Compass Needle and Magnetic Fields:

• A compass needle aligns itself along the direction of the magnetic field at any given point, helping visualize the field lines.

• If field lines intersected, the compass needle would experience conflicting forces, leading to ambiguous alignment, which does not occur in reality.

• Other Incorrect Options Explained:

• Option 1: Magnetic field lines do not repel each other due to like polarity. This is incorrect because field lines represent the direction of the field, not physical entities that repel.

• Option 3: Magnetic field lines are not always parallel inside the magnet. Instead, they form continuous loops, transitioning from south to north inside the magnet.

• Option 4: Magnetic field strength is not zero at the point where two lines could cross; the issue is with direction, not magnitude.

• Applications of Magnetic Field Lines:

• They are used to visualize the behavior of magnetic fields in devices like motors, transformers, and magnetic storage systems.

• Field lines help in understanding the magnetic effects in Earth's magnetic field, solenoids, and electromagnets.

Important Points

• Magnetic Field Line Experiments: Use of iron filings or compass needles to trace field lines around a magnet demonstrates their non-intersecting nature.

• Earth's Magnetic Field: Earth's magnetic field lines also follow the same rules, forming a dipole structure with non-intersecting lines.

• Technological Implications: Magnetic field visualization is crucial in designing and analyzing magnetic circuits, magnetic resonance imaging (MRI), and other applications.

• Historical Note: The concept of magnetic field lines was introduced by Michael Faraday, who laid the foundation for understanding electromagnetic phenomena.

Q18. Answer: (d) Incomplete combustion with unburnt carbon particles

The correct answer is Incomplete combustion with unburnt carbon particles.

Key Points

• A yellow luminous flame is a clear indicator of incomplete combustion. This occurs when there is insufficient oxygen available for the fuel to combust completely.

• During incomplete combustion, unburnt carbon particles are released into the flame. These particles become heated and emit a yellow glow, giving the flame its characteristic color.

• Complete combustion, in contrast, results in a blue flame due to the efficient burning of the fuel, producing only carbon dioxide and water as byproducts. Hence, the yellow flame is not a sign of complete combustion.

• The formation of carbon dioxide is primarily associated with complete combustion, where hydrocarbons react fully with oxygen, and it does not contribute to the yellow color of the flame.

• The combustion of metals generally produces a bright white or colored flame depending on the metal but does not result in a yellow luminous flame. Therefore, this option is irrelevant.

Additional Information

• Incomplete Combustion:

• Occurs when there is a lack of oxygen supply during the burning of fuel.

• Produces byproducts such as carbon monoxide (CO), unburnt carbon particles (soot), and sometimes other hydrocarbons.

• It is less efficient and can be hazardous due to the release of carbon monoxide, a toxic gas.

• Examples include burning coal or wood in a poorly ventilated space.
• Complete Combustion:
• Requires adequate oxygen for the fuel to burn completely.
• Produces water (H2O) and carbon dioxide (CO2) as byproducts.
• The flame is typically blue due to the absence of unburnt carbon particles.
• Examples include the burning of natural gas in a gas stove or a well-tuned engine.
• Combustion of Metals:
• Metals like magnesium produce a bright white flame when combusted.
• Certain metals give distinct flame colors, e.g., sodium produces a yellow flame, copper produces green, etc.
• These flames are not related to incomplete combustion but rather the excitation of metal atoms.
• Flame Characteristics:
• The color of a flame can indicate the type of combustion:
• Blue Flame: Complete combustion, high temperature, efficient burning.
• Yellow Flame: Incomplete combustion, presence of soot, lower temperature.
• A yellow flame is often observed in candles or kerosene lamps.

Important Points

• Hazards of Incomplete Combustion:
• Releases carbon monoxide (CO), which is a colorless, odorless, and highly toxic gas.
• Contributes to air pollution due to the release of particulate matter and other harmful gases.
• Leads to energy wastage as the fuel does not burn completely, reducing efficiency.
• Applications of Flame Analysis:
• Used in chemical analysis to identify elements based on the flame color they produce.
• Applied in industries to monitor combustion efficiency in furnaces and burners.

Q19. Answer: (b) A person continues to move forward when a car stops suddenly.

The correct answer is A person continues to move forward when a car stops suddenly..

Key Points

• The First Law of Motion, also known as Newton's First Law or the Law of Inertia, states that an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force.
• When a car stops suddenly, a person inside the car continues to move forward due to inertia. This is because the body tends to maintain its state of motion unless an external force (like a seatbelt) acts on it. Hence, this statement is correct.
• A rocket launching upward does not directly illustrate the First Law of Motion but is instead an example of Newton's Third Law, which involves action and reaction forces. Hence, this statement is incorrect.
• A car accelerating when the engine is started demonstrates the application of a net external force, which aligns with Newton's Second Law of Motion (Force = mass × acceleration). Hence, this statement is incorrect.
• A stone falling freely under gravity illustrates Newton's Second Law since the acceleration due to gravity acts on the stone. It is not an example of the First Law. Hence, this statement is incorrect.

Additional Information

• Newton's First Law of Motion (Law of Inertia):
• An object at rest stays at rest, and an object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced external force.
• This law emphasizes the concept of inertia, which is the resistance of an object to changes in its state of motion.
• Inertia:
• Inertia is the property of a body due to which it resists any change in its state of rest or uniform motion.
• Example: When a train suddenly stops, passengers inside experience a forward motion because their bodies resist the sudden change in motion.
• Newton's Second Law of Motion:
• This law states that the force acting on an object is equal to the mass of the object times its acceleration (F = ma).
• Example: A car accelerating demonstrates the application of a net force.
• Newton's Third Law of Motion:
• This law states that for every action, there is an equal and opposite reaction.
• Example: The upward motion of a rocket is due to the downward expulsion of gases, which creates an equal and opposite reaction force.

• Applications of Newton's First Law:

• Seatbelts in cars are designed to counter inertia, preventing passengers from continuing forward motion during sudden stops.

• Tablecloth trick: Quickly pulling a tablecloth from under dishes without moving them illustrates inertia.

Important Points

• Significance of Inertia:

• It explains why passengers in a moving vehicle lurch forward when the vehicle comes to a sudden stop.

• It is crucial in understanding the dynamics of motion in various systems, from vehicles to celestial bodies.

• Historical Context:

• Newton's First Law was influenced by the earlier work of Galileo Galilei, who studied motion and the principle of inertia.

• Isaac Newton formulated the laws of motion in his seminal work "Philosophiæ Naturalis Principia Mathematica", published in 1687.

Q20. Answer: (a) An atom or group of atoms with a net electric charge

The correct answer is An atom or group of atoms with a net electric charge.

Key Points

• Definition of an Ion: An ion is an atom or group of atoms that has gained or lost electrons, resulting in a net electric charge. This can be a positive charge (cation) or a negative charge (anion).

• Formation of Ions: Ions form when an atom or molecule either loses or gains electrons to achieve a stable electronic configuration, often following the octet rule.

• Types of Ions:

• Cation: Formed when an atom loses electrons, resulting in a positive charge. Example: Na^+ (Sodium ion).

• Anion: Formed when an atom gains electrons, resulting in a negative charge. Example: Cl^- (Chloride ion).

• Misconceptions Clarified:

• An ion is not defined by the number of protons or neutrons but by its imbalance of protons and electrons.

• Neutral molecules do not qualify as ions, even if they are formed by ionic bonding.

• Ions are distinct from isotopes, which involve a change in the number of neutrons, not electrons.

• Examples of Common Ions:

• Monatomic ions: Na^+, Cl^-, K^+, Ca^(2+).

• Polyatomic ions: SO4^(2-) (Sulfate), NO3^- (Nitrate), NH4^+ (Ammonium).

Additional Information

• Charge Calculation: The charge of an ion is determined by the difference between the number of protons and electrons. For example:

• If an atom has 11 protons and 10 electrons, it has a charge of +1 (Na^+).

• If an atom has 17 protons and 18 electrons, it has a charge of -1 (Cl^-).

• Electron Configuration of Ions: When ions form, their electron configuration changes to resemble the nearest noble gas. Example:

• Na (11 electrons) loses one electron to form Na^+, resembling Ne (10 electrons).

• Cl (17 electrons) gains one electron to form Cl^-, resembling Ar (18 electrons).

• Applications of Ions:

• Electrolytes: Essential for nerve conduction and muscle function in biological systems. Examples: Na^+, K^+, Ca^(2+).

• Industrial Use: Used in processes like electroplating, batteries (e.g., Li^+ in lithium-ion batteries), and chemical synthesis.

• Environmental Role: Ions like NO3^- (Nitrate) play a significant role in soil fertility and the nitrogen cycle.

• Isotopes vs. Ions: It is important to differentiate between isotopes and ions:

• Isotopes: Atoms of the same element with different numbers of neutrons but the same number of protons.

• Ions: Atoms or molecules with a net electric charge due to an imbalance of protons and electrons.

• Bonding and Ions:

• Ionic Bonding: Occurs when ions of opposite charges attract each other. Example: NaCl (table salt).

• Covalent Bonding: Does not involve the formation of ions but instead involves the sharing of electrons.

Q21. Answer: (b) hydrophillic head

The correct answer is hydrophilic head.

Key Points

• Micelles are tiny spherical structures formed by soap molecules in water. They are formed when the soap concentration in water

crosses a critical micelle concentration.

• Each soap molecule has two distinct parts: a hydrophobic tail (water-repelling) and a hydrophilic head (water-attracting).

• The hydrophilic head of the soap molecule interacts with water molecules because it is polar in nature, allowing micelles to remain suspended in water.

• When soap is added to water, its hydrophobic tail avoids water and clusters together, while the hydrophilic head faces outward, interacting with water. This arrangement creates a stable micelle structure.

• The ability of micelles to interact with water and trap oily dirt is attributed to the polar nature of the hydrophilic head, which forms a strong interaction with water molecules.

Additional Information

• Structure of Soap Molecules:

• Soap molecules are composed of a long hydrocarbon chain (hydrophobic tail) and a carboxylate ion (hydrophilic head).

• The hydrophobic tail is nonpolar and repels water, while the hydrophilic head is polar and interacts with water molecules.

• Formation of Micelles:

• When soap is added to water, the molecules arrange themselves in a spherical structure called a micelle.

• In a micelle, the hydrophilic heads face outward toward the water, and the hydrophobic tails cluster inward, avoiding water.

• Cleaning Action of Soap:

• The hydrophobic tail attaches to oily dirt, while the hydrophilic head remains in contact with water.

• This action forms an emulsion, breaking down the grease into smaller droplets that can be washed away with water.

• Importance of Hydrophilic Head:

• The hydrophilic head ensures that soap molecules remain dispersed in water, preventing the micelles from aggregating and settling at the bottom.

• It also helps in the removal of dirt by solubilizing it into water.

• Applications of Micelles:

• Micelles are widely used in cleaning, emulsification, and even in drug delivery systems in pharmaceuticals.

• Their unique structure allows them to trap hydrophobic substances like oils and grease and interact with water simultaneously.

Important Points

• Hydrophobic Tail:

• The hydrophobic tail is made of a long hydrocarbon chain, which repels water.

• It plays a critical role in trapping grease and oil but does not interact directly with water.

• Hydrophilic Head:

• The hydrophilic head is ionic or polar in nature, allowing it to form hydrogen bonds with water molecules.

• This property is crucial for the formation of micelles and their interaction with water.

• Critical Micelle Concentration (CMC):

• Micelles form only when the concentration of soap in water exceeds a certain threshold known as the Critical Micelle Concentration.

• Below this concentration, soap molecules remain dispersed and do not form micelles.

Q22. Answer: (a) Uniform motion

The correct answer is Uniform motion.

Key Points

• Uniform motion refers to the motion of an object that covers equal distances in equal intervals of time, regardless of how small the time intervals are.

• In uniform motion, the velocity of the object remains constant. This means that there is no change in speed or direction over time.

• Examples of uniform motion include a car moving at a constant speed on a straight road or light traveling through a vacuum.

• This type of motion is characterized by a straight-line graph of displacement vs. time, indicating a constant rate of change in position.

• Uniform motion is an idealized concept often used in physics to simplify real-world scenarios, as most motions in real life are non-uniform due to external forces like friction and air resistance.

Additional Information

• Accelerated motion:

• In accelerated motion, an object's velocity changes over time due to the application of a net force.

• Acceleration can be positive (speeding up) or negative (slowing down).

• Examples include a car speeding up when the accelerator is pressed or a ball falling under the influence of gravity.
• Circular motion:
• Circular motion refers to the movement of an object along a circular path.
• It can be uniform (constant speed) or non-uniform (changing speed).
• In uniform circular motion, although the speed is constant, the direction of velocity changes continuously, resulting in centripetal acceleration directed towards the center of the circle.
• Examples include the motion of planets around the sun or a car taking a circular turn.
• Non-uniform motion:
• In non-uniform motion, an object covers unequal distances in equal intervals of time, or its speed/direction changes over time.
• This is the most common type of motion observed in real-life scenarios due to external factors like friction and varying forces.
• An example is a vehicle moving in heavy traffic where it speeds up, slows down, or stops intermittently.
• Applications of Uniform Motion:
• Uniform motion is used in navigation systems to calculate distance and time accurately.
• It is also an important concept in designing transportation systems and in the study of celestial mechanics.

Important Points

• Graphs of Motion:
• In uniform motion, a graph of distance vs. time is a straight line with a constant slope.
• For non-uniform motion, the graph may curve or have varying slopes, indicating changes in speed or direction.
• Equation for Uniform Motion:
• The equation of motion is given by s = vt, where s is displacement, v is velocity, and t is time.
• Difference from Real-World Motion:
• Uniform motion is an idealized concept, while real-world motions are often influenced by external forces like friction and air resistance, making them non-uniform.

Q23. Answer: (c) Iron

The correct answer is Iron.

Key Points

• Speed of sound is highest in solids compared to liquids and gases due to the dense molecular structure and strong intermolecular forces.
• In iron, the speed of sound is approximately 5960 m/s, which is significantly higher than in water or air.
• Sound travels slower in liquids like water (approximately 1482 m/s) because molecules are less tightly packed compared to solids.
• In gases like air at room temperature, the speed of sound is much lower, around 343 m/s, due to the sparse arrangement of molecules.
• Sound cannot travel in a vacuum as there are no molecules to propagate the vibration. Hence, the speed of sound is effectively zero in a vacuum.

Additional Information

• Speed of Sound in Different Media:
• In solids, sound travels faster due to the closely packed molecules. For example, in steel, the speed of sound is about 5960 m/s.
• In liquids, the speed of sound is slower than in solids but faster than in gases. For instance, in water, the speed of sound is approximately 1482 m/s.
• In gases, the speed of sound is the lowest due to sparse molecular arrangements. In air at room temperature, it is about 343 m/s.
• In a vacuum, sound cannot propagate as it requires a medium to travel. Therefore, the speed of sound in vacuum is effectively zero.
• Factors Affecting Speed of Sound:
• The speed of sound depends on the medium's density and elasticity. Higher density and stronger intermolecular forces result in faster sound propagation.
• In gases, the speed of sound increases with the temperature, as higher temperatures lead to increased molecular kinetic energy.
• In liquids, the speed of sound depends on the compressibility and density of the liquid.
• In solids, the speed of sound is influenced by the material's Young's modulus and density.
• Applications:
• High-speed sound propagation in solids is utilized in ultrasound imaging for industrial and medical purposes.
• Understanding sound speed in different media is crucial for acoustic engineering and designing devices like sonar systems.

• In seismic studies, the speed of sound in Earth's layers helps scientists analyze geological structures.

Important Points

• Numerical Values:

• Iron: Approximately 5960 m/s

• Water: Approximately 1482 m/s

• Air: Approximately 343 m/s

• Vacuum: 0 m/s

• Scientific Insight: Sound requires a medium to propagate, and its speed is directly influenced by the medium's density, elasticity, and temperature.

• Practical Understanding: The speed of sound in solids like iron is utilized in various industries, such as construction and material testing.

Q24. Answer: (a) Metallurgy

The correct answer is Metallurgy.

Key Points

• Metallurgy refers to the process of extracting metals from their ores, refining them, and preparing them for use. This includes processes such as concentration, reduction, and purification of metals.

• The primary steps of metallurgy include:

• Concentration: Removing unwanted impurities (gangue) from the ore.

• Reduction: Converting the metal oxide to the pure metal, often using carbon or other reducing agents.

• Refining: Purifying the extracted metal to enhance its quality and usability.

• The field of metallurgy is divided into three main branches:

• Extractive Metallurgy: Deals with the extraction of metals from ores.

• Physical Metallurgy: Focuses on the physical properties and structure of metals.

• Mechanical Metallurgy: Concerned with the mechanical properties of metals.

• Metallurgy is essential for producing metals like iron, copper, aluminum, and gold, which play a significant role in modern industries.

• The importance of metallurgy extends to various applications, such as construction, transportation, electronics, and energy production.

Additional Information

• Smelting:

• Smelting is a part of metallurgy that involves heating ores to high temperatures to extract metals.

• It is primarily used for metals like iron, copper, and lead.

• For example, blast furnaces are used in smelting iron ore to produce pig iron.

• Mining:

• Mining refers to the extraction of ores or minerals from the earth.

• It is the first step before metallurgy and involves processes like surface mining and underground mining.

• For example, gold mines in South Africa are a significant source of gold extraction.

• Refining:

• Refining focuses on purifying metals to achieve higher quality and usability.

• Common refining methods include electrolysis, zone refining, and distillation.

• For example, electrolytic refining is used to purify copper.

• Applications of Metallurgy:

• Metals like steel are used in construction and automobile industries.

• Aluminum is widely used in packaging and aerospace applications due to its lightweight properties.

• Gold and silver are used in jewelry and electronics due to their excellent conductivity and resistance to corrosion.

• Important Facts:

• The Industrial Revolution marked significant advancements in metallurgy, particularly in the production of steel.

• India is one of the leading producers of iron and steel, with major plants located in Bhilai, Bokaro, and Jamshedpur.

• Modern metallurgical research focuses on developing alloys with enhanced properties like strength, heat resistance, and corrosion resistance.

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Q25. Answer: (b) Hormones are used for fish breeding

The correct answer is Hormones are used for fish breeding.

Key Points

• Hormones are used for fish breeding:

• In modern aquaculture, artificial breeding methods often utilize hormones to induce spawning in fish species that do not breed naturally in captivity.

• The hormonal injections, such as Human Chorionic Gonadotropin (HCG) or pituitary extracts, stimulate the reproductive organs to mature and release eggs or sperm for fertilization.

• This technique is crucial for breeding commercially important species like carps, catfish, and tilapia. Hence, this statement is correct.

• All fish seeds are collected from rivers:

• This statement is incorrect as modern fish farming relies on hatcheries for seed production rather than river collection. Collecting seeds from rivers is traditional and unsustainable for large-scale production.

• Hatcheries ensure a controlled and consistent supply of fish seeds with better survival rates.

• Enzymes are used to help fish grow bigger:

• This statement is incorrect. Enzymes are not directly used to enhance fish growth. Instead, fish growth depends on balanced nutrition, genetics, and environmental conditions.

• While enzymes may be added to fish feed to improve digestion, they do not directly contribute to increasing the size of fish.

• Fish farming cannot be done in ponds:

• This statement is incorrect. Fish farming is extensively practiced in ponds, tanks, and cages across the globe.

• Pond aquaculture is a popular and efficient method for rearing various fish species such as carps, catfish, and tilapia.

Additional Information

• Role of Hormones in Aquaculture:

• Hormonal induction is a widely used method to overcome problems like seasonal breeding and poor reproductive performance in captivity.

• Examples of hormones used include Ovaprim, a synthetic hormone widely used for breeding Indian major carps and other species.

• This method ensures a continuous supply of fish seeds for commercial aquaculture.

• Hatchery Systems in Fish Farming:

• Hatcheries are controlled environments designed to breed, hatch, and raise fish larvae until they are ready for stocking in grow-out systems.

• They provide a reliable source of fingerlings and help reduce the dependence on wild fish populations.

• Countries like India, China, and Vietnam have large-scale hatcheries for fish seed production.

• Fish Nutrition and Growth:

• Fish growth is influenced by a combination of genetic, nutritional, and environmental factors.

• Modern aquaculture uses formulated feeds with balanced levels of protein, lipids, vitamins, and minerals to optimize fish growth.

• Enzymes in feed, such as proteases and phytases, improve nutrient absorption but do not directly increase fish size.

• Types of Aquaculture Systems:

• Pond aquaculture: Most common and cost-effective system for rearing freshwater fish.

• Tank or recirculating aquaculture systems (RAS): Advanced systems used to maintain water quality and control environmental factors.

• Cage aquaculture: Practiced in open water bodies like lakes and reservoirs for species like salmon and trout.

Important Points

• Global Aquaculture Production:

• According to the FAO's 2022 report, aquaculture contributes over 50% of the world’s fish supply.

• Major contributors include countries like China (60%), India, Indonesia, and Vietnam.

• Environmental Sustainability in Aquaculture:

• Practices like integrated multi-trophic aquaculture (IMTA) and biofloc technology are gaining traction to minimize environmental impacts.

• Efforts are being made to reduce dependence on wild fish for feed by using plant-based alternatives and microbial proteins.

Q26. Answer: (d) 1.21

Shortcut Trick

Distance covered by tip in 1 hour (3600s) = 2 × 22/7 × 63 = 396 cm.

Speed of minute hand tip = 396 ÷ 3600 = 0.11 cm/s.
Arc length in 11 seconds = 0.11 × 11 = 1.21 cm.
Therefore The correct answer is 1.21 cm.
Alternate Method
Given:
Length of minute hand (r) = 63 cm
Time duration (t) = 11 seconds
Formula Used:
Arc Length = (Time ÷ Total Time for 1 rotation) × 2 × π × r
=> Total time for minute hand to complete 1 revolution = 60 minutes = 3600 seconds
=> Circumference of the path = 2 × (22 ÷ 7) × 63
=> Circumference = 2 × 22 × 9 = 396 cm
=> Arc length in 11 seconds = (11 ÷ 3600) × 396
=> Arc length = (11 × 396) ÷ 3600
=> Arc length = 4356 ÷ 3600
=> Arc length = 1.21 cm
Therefore The correct answer is 1.21 cm.
Additional Information
Angular speed of hands
The minute hand covers 6° per minute (360° ÷ 60), and the hour hand covers 0.5° per minute (30° ÷ 60).
Arc length and Sector area
For a circle of radius r and central angle θ (in degrees), Arc Length = (θ ÷ 360) × 2πr and Area of Sector = (θ ÷ 360) × πr².
Relative speed of hands
The relative angular speed between the minute hand and the hour hand is 5.5° per minute (6° − 0.5°).

Q27. Answer: (a) $6y^2$

Shortcut Trick
Third proportional (c) of two numbers a and b is given by $c = b^2 / a$.
Given: $a = 54x^2$ and $b = 18xy$.
$c = (18xy \times 18xy) \div 54x^2$
$c = 324x^2y^2 \div 54x^2$
$c = 6y^2$
Therefore The correct answer is $6y^2$.
Alternate Method
Given:
First term (a) = $54x^2$
Second term (b) = 18xy
Formula Used:
If a, b, and c are in continued proportion, then a : b :: b : c, where c is the third proportional.
=> a/b = b/c
=> $c = b^2 / a$
Calculations:
=> Third Proportional (c) = $(18xy)^2 \div 54x^2$
=> $c = (18 \times 18 \times x^2 \times y^2) \div 54x^2$
=> $c = (324x^2y^2) \div 54x^2$
=> $c = (324 \div 54) \times (x^2 \div x^2) \times y^2$
=> $c = 6 \times 1 \times y^2$
=> $c = 6y^2$
Therefore The correct answer is $6y^2$.
Additional Information
Mean Proportional
The mean proportional between two numbers a and b is calculated as √(a × b).

Fourth Proportional

If a : b :: c : d, then d is the fourth proportional and is given by d = (b × c) ÷ a.

Continued Proportion

Three numbers a, b, and c are in continued proportion if a/b = b/c, which implies $b^2 = ac$.

Q28. Answer: (a) 18

Shortcut Trick

Identify the smallest number in the set: 18.

Check if 18 divides the other numbers: 54 ÷ 18 = 3 and 72 ÷ 18 = 4.

Since 18 is a factor of both 54 and 72, it is the Highest Common Factor.

Therefore The correct answer is 18.

Alternate Method

Given numbers: 18, 54, 72

Method: Prime Factorization

=> Prime factorization of 18 = $2^1 \times 3^2$

=> Prime factorization of 54 = $2^1 \times 3^3$

=> Prime factorization of 72 = $2^3 \times 3^2$

=> HCF = Product of common prime factors with the lowest power

=> HCF = $2^1 \times 3^2$

=> HCF = 2 × 9 = 18

Therefore The correct answer is 18.

Additional Information

HCF and LCM Relation

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

Co-prime Numbers

Two numbers are called co-prime if their Highest Common Factor (HCF) is 1.

Methods to find HCF

HCF can be found using Prime Factorization, the Listing Factors method, or the Long Division (Euclidean) method.

Q29. Answer: (c) 5.25

Shortcut Trick

Apply BODMAS: [3 ÷ 2 × 5] − (3 ÷ 12) − 2

Solve Square Bracket: 1.5 × 5 = 7.5

Solve Small Bracket: 3 ÷ 12 = 0.25

Combine: 7.5 − 0.25 − 2 = 5.25

Therefore The correct answer is 5.25.

Alternate Method

Given:

Expression: [3 ÷ 2 × (7 − 2)] − (3 ÷ 2 of 6) − 2

Formula Used:

BODMAS Rule: B (Brackets), O (Of), D (Division), M (Multiplication), A (Addition), S (Subtraction)

Calculation:

=> [3 ÷ 2 × 5] − (3 ÷ (2 × 6)) − 2

=> [1.5 × 5] − (3 ÷ 12) − 2

=> 7.5 − 0.25 − 2

=> 7.25 − 2

=> 5.25

Therefore The correct answer is 5.25.

Additional Information

BODMAS Rule

It defines the sequence of operations: Brackets → Of → Division → Multiplication → Addition → Subtraction.

Difference between 'of' and '×'

Though both represent multiplication, 'of' (O) is evaluated before Division (D), whereas Multiplication (M) is evaluated after Division.

Grouping Symbols

Standard hierarchy for brackets is: Parentheses () → Braces {} → Square Brackets [].

Q30. Answer: (d) $x^2 + 14x + 49$

Shortcut Trick

Apply the algebraic identity: $(a + b)^2 = a^2 + 2ab + b^2$

Here, a = x and b = 7.

$(x + 7)^2 = x^2 + 2 \times x \times 7 + 7^2$

$= x^2 + 14x + 49$

Therefore The correct answer is $x^2 + 14x + 49$.

Alternate Method

Given expression: $(x + 7)^2$

Expanding the power by multiplying the term by itself:

=> $(x + 7) \times (x + 7)$

=> $x(x + 7) + 7(x + 7)$

=> $x^2 + 7x + 7x + 49$

=> $x^2 + 14x + 49$

Therefore The correct answer is $x^2 + 14x + 49$.

Additional Information

Square of Difference Identity

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

Difference of Two Squares

Multiplying the sum and difference of two terms results in $(a + b)(a - b) = a^2 - b^2$.

Square of a Trinomial

The expansion for three terms is $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$.

Q31. Answer: (c) 76.6

Shortcut Trick

Assume base average = 75.

Extra score from 10 students = $10 \times (90 - 75) = 150$.

Distributed extra score over 93 students = $150 \div 93 \approx 1.61$.

Final Average = Base + Distributed extra = 75 + 1.61 = 76.61.

Therefore The correct answer is 76.6.

Alternate Method

Given: Total students = 93 | Group 1 = 10 students (Avg 90) | Group 2 = 83 students (Avg 75).

Formula Used: Average = Total Sum ÷ Number of Students

=> Sum of scores of 10 students = $10 \times 90 = 900$

=> Number of remaining students = $93 - 10 = 83$

=> Sum of scores of 83 students = $83 \times 75 = 6225$

=> Total sum of scores for the class = $900 + 6225 = 7125$

=> Class Average = Total Sum ÷ Total Students = $7125 \div 93$

=> Class Average ≈ 76.6129...

=> Rounded Average = 76.6

Therefore The correct answer is 76.6.

Additional Information

Weighted Average Formula

The combined average A = (n1a1 + n2a2) ÷ (n1 + n2), where n is the quantity and a is the individual average.

Net Deviation Principle

Sum of deviations from the actual average is always zero. This helps in finding missing values or correcting errors in data.

Rounding Rule

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To round to one decimal place, check the second decimal digit; if it is 5 or more, increase the first decimal by 1, otherwise leave it unchanged.

Q32. Answer: (d) 2.96 cm

Shortcut Trick

Rise in water level = Volume of submerged object ÷ Base area of container

Volume of submerged Cube = 20 × 20 × 20 = 8000 cm^3

Base Area of Aquarium = 60 × 45 = 2700 cm^2

Rise = 8000 ÷ 2700 = 80 ÷ 27 ≈ 2.96 cm

Therefore The correct answer is 2.96 cm.

Alternate Method

Given: Dimensions of aquarium = 60 cm × 45 cm × 40 cm. Side of metallic cube = 20 cm.

Formula used: Rise in level (h) = Volume of submerged solid ÷ Area of base

=> Base area of the aquarium = Length × Breadth

=> Base area = 60 × 45 = 2700 cm^2

=> Volume of the metallic cube = $(side)^3$

=> Volume = 20 × 20 × 20 = 8000 cm^3

=> Rise in water level (h) = Volume of cube ÷ Base area

=> h = 8000 ÷ 2700

=> h = 80 ÷ 27 = 2.9629...

=> h ≈ 2.96 cm

Therefore The correct answer is 2.96 cm.

Additional Information

Volume of Cuboid and Cube

Volume of a cuboid = L × B × H; Volume of a cube = a^3, where a is the side length.

Displacement Principle

When a solid is completely immersed in a liquid, the volume of liquid displaced is equal to the volume of the solid.

Water Level Rise

The rise in level h in a vessel with uniform cross-section area A is h = V ÷ A, where V is the volume of the submerged object.

Q33. Answer: (a) Increase by 3%

Shortcut Trick

Ratio of cost of Washing Machine (WM) to TV = 25 : 100 = 1 : 4.

Total expenditure ratio for 4 WM and 3 TV = (1 × 4) : (4 × 3) = 4 : 12.

Apply Weighted Average Change: [(4 × 72%) + (12 × −20%)] ÷ (4 + 12)

Net % change = (288 − 240) ÷ 16 = 48 ÷ 16 = 3%.

Positive result indicates an increase.

Therefore The correct answer is Increase by 3%.

Alternate Method

Given:

Cost of WM = 75% less than TV

Increase in WM cost = 72% | Decrease in TV cost = 20%

Quantity: WM = 4, TV = 3

Formula Used:

Total Cost = (Price_(WM) × Quantity_(WM)) + (Price_(TV) × Quantity_(TV))

Percentage Change = [(New Cost − Old Cost) ÷ Old Cost] × 100

=> Let cost of 1 TV = Rs. 100

=> Cost of 1 WM = 100 − 75% of 100 = Rs. 25

=> Initial total cost = (4 × 25) + (3 × 100) = 100 + 300 = Rs. 400

=> New cost of 1 WM = 25 + 72% of 25 = 25 + 18 = Rs. 43

=> New cost of 1 TV = 100 − 20% of 100 = Rs. 80

=> New total cost = (4 × 43) + (3 × 80) = 172 + 240 = Rs. 412

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=> Change in total cost = 412 − 400 = Rs. 12

=> Percentage change = (12 ÷ 400) × 100 = 3%

Therefore The correct answer is Increase by 3%.

Additional Information

Weighted Average Method

It is used when different groups have different weights or quantities. Formula: Average = (Σ n_i × w_i) ÷ Σ w_i where n is the value and w is the weight.

Percentage Increase/Decrease

A change of x% can be calculated using the multiplying factor: (100 + x)/100 for increase and (100 − x)/100 for decrease.

Base Value Concept

When comparing "x% less than y", y is always the base (100%). WM = TV × (100 − 75)/100.

Q34. Answer: (b) 24 cm

Shortcut Trick

Check the ratio of the sides: 24 : 32 : 40 → 3 : 4 : 5.

Since $3^2 + 4^2 = 5^2$, the triangle is right-angled.

In a right-angled triangle, the two legs are altitudes to each other.

The legs are 24 cm and 32 cm; thus, the altitude to the 32 cm side is 24 cm.

Therefore The correct answer is 24 cm.

Alternate Method

Given: Sides of the triangle are a = 24 cm, b = 32 cm, and c = 40 cm.

Formula: Area = √[s(s − a)(s − b)(s − c)] and Area = 1/2 × base × altitude.

=> Semi-perimeter (s) = (24 + 32 + 40) / 2 = 48 cm

=> Area = √[48 × (48 − 24) × (48 − 32) × (48 − 40)]

=> Area = √[48 × 24 × 16 × 8] = 384 cm^2

=> Area corresponding to side 32 cm = 1/2 × 32 × Altitude

=> 384 = 16 × Altitude

=> Altitude = 384 / 16 = 24 cm

Therefore The correct answer is 24 cm.

Additional Information

Pythagorean Triplets

Any set of three integers (a, b, c) such that $a^2 + b^2 = c^2$ forms a right-angled triangle where a and b are legs.

Altitude to Hypotenuse

In a right triangle with legs a and b and hypotenuse c, the altitude to the hypotenuse is (a × b) / c.

Right Triangle Area

The area of a right-angled triangle is simply 1/2 × Product of the legs.

Q35. Answer: (b) 69

Shortcut Trick

Ratio of numbers = 7 : 3

Difference in ratio parts = 7 − 3 = 4 units

Given difference = 92

Therefore 1 unit = 92 ÷ 4 = 23

Smaller number = 3 units = 3 × 23 = 69

Therefore The correct answer is 69.

Alternate Method

Given:

Ratio of two numbers = 7 : 3

Difference between numbers = 92

Let the two numbers be 7x and 3x.

According to the question:

=> 7x − 3x = 92

=> 4x = 92
=> x = 92 ÷ 4
=> x = 23
Calculating the smaller number:
=> Smaller number = 3x
=> Smaller number = 3 × 23
=> Smaller number = 69
Therefore The correct answer is 69.
Additional Information
Sum of Numbers
If the ratio is a : b and the difference is D, the sum of the numbers can be calculated as [(a + b) ÷ (a − b)] × D.
Finding the Larger Number
If the ratio is a : b (where a > b) and the difference is D, the larger number is [a ÷ (a − b)] × D.
Ratio Constant
A ratio a : b implies that the actual values are ak and bk, where k is a non-zero constant called the common multiplier.

Q36. Answer: (d) 96%

Shortcut Trick
Ratio of MP : SP = 6,250 : 250
=> 25 : 1
Discount = 25 − 1 = 24 units
Discount % = (24 / 25) × 100 = 96%
Therefore The correct answer is 96%.
Alternate Method
Given: Marked Price (MP) = Rs. 6,250, Selling Price (SP) = Rs. 250
Formula: Discount % = [(MP − SP) / MP] × 100
=> Discount = 6250 − 250 = 6000
=> Discount % = (6000 / 6250) × 100
=> Discount % = (600 / 625) × 100
=> Discount % = (24 / 25) × 100
=> Discount % = 24 × 4 = 96%
Therefore The correct answer is 96%.
Additional Information
Marked Price (MP)
It is the price displayed on the tag of an article. Discounts are always calculated on the Marked Price.
Discount Formula
Discount = MP − SP. If no discount is given, then SP = MP.
Relationship between CP and MP
The ratio of Marked Price to Cost Price is given by: MP/CP = (100 + Profit%)/(100 − Discount%).

Q37. Answer: (b) 75 hours

Shortcut Trick
Time for P = 42 × 5/2 = 105 hrs, Time for Q = 30 × 5/2 = 75 hrs.
Let Capacity = 525 units (LCM of 105, 75). Efficiency: P = 5, Q = 7.
Work done by P + Q in 5 hours = (5 + 7) × 5 = 60 units.
Efficiency of R (emptying) = 60 / 12 = 5 units/hr.
Net efficiency of P + Q + R = 5 + 7 − 5 = 7 units/hr.
Total time required = 525 / 7 = 75 hours.
Therefore The correct answer is 75 hours.
Alternate Method
Given: P fills 2/5 tank in 42 hrs, Q fills 2/5 tank in 30 hrs. R empties filled water in 12 hrs.
Formula: Efficiency = Total Work ÷ Time

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=> Time for P to fill full tank = 42 × 5 ÷ 2 = 105 hours

=> Time for Q to fill full tank = 30 × 5 ÷ 2 = 75 hours

=> Let Total capacity of tank = LCM(105, 75) = 525 units

Pipes	Time	Quantity	Efficiency
P	105	525	5
Q	75	7	

=> Efficiency of P + Q = 5 + 7 = 12 units/hr

=> Water filled in 5 hours = 12 × 5 = 60 units

=> R empties 60 units in 12 hours

=> Efficiency of R = −(60 ÷ 12) = −5 units/hr

=> Combined efficiency of P, Q, and R = 5 + 7 − 5 = 7 units/hr

=> Time to fill the tank together = Total Quantity ÷ Total Efficiency

=> Time = 525 ÷ 7 = 75 hours

Therefore The correct answer is 75 hours.

Additional Information

Inlet and Outlet Pipes

Inlet pipes fill the tank (positive efficiency) while outlet pipes empty the tank (negative efficiency).

Time and Efficiency Relation

Time taken to fill/empty is inversely proportional to efficiency: Time = Capacity ÷ Efficiency.

Pipes and Cisterns Net Work

If pipe A fills in x hours and pipe B empties in y hours, net work in 1 hour = (1/x − 1/y).

Q38. Answer: (a) 0.5

Shortcut Trick

Simplify both fractions to their decimal equivalents for quick comparison.

1/20 = 0.05

9/90 = 1/10 = 0.1

Required value = 0.05 ÷ 0.1 = 0.5

Therefore The correct answer is 0.5.

Alternate Method

Given:

First fraction = 1/20

Second fraction = 9/90

Formula:

Percentage ratio = (First fraction ÷ Second fraction)

=> First fraction = 1/20 = 0.05

=> Second fraction = 9/90 = 1/10 = 0.1

=> Required value = 0.05 ÷ 0.1

=> Required value = 0.5

Therefore The correct answer is 0.5.

Additional Information

Fraction to Percentage

To convert a fraction to a percentage, multiply by 100. Example: 1/2 × 100 = 50%.

Reciprocal Multiplication

Dividing by a fraction is the same as multiplying by its reciprocal: (a/b) ÷ (c/d) = (a/b) × (d/c).

Decimal Conversion

Standard conversions: 1/20 = 0.05, 1/10 = 0.1, 1/5 = 0.2, 1/4 = 0.25.

Q39. Answer: (c) 144

Shortcut Trick

Total Distance = Train length + Platform length = 1 + 3 = 4 times the train length.

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Total Distance = 4 × 290 = 1160 m.
Speed in m/s = 1160 ÷ 29 = 40 m/s.
Speed in km/hr = 40 × 18/5 = 8 × 18 = 144 km/hr.
Therefore The correct answer is 144.
Alternate Method
Given:
Length of the train (L_t) = 290 m
Length of the platform (L_p) = 3 × L_t = 3 × 290 = 870 m
Time taken (t) = 29 seconds
Formula Used:
Speed = Total Distance ÷ Total Time
Total Distance = Length of Train + Length of Platform
Conversion: Speed (km/hr) = Speed (m/s) × 18/5
Calculations:
=> Total Distance = 290 + 870 = 1160 m
=> Speed (m/s) = 1160 ÷ 29
=> Speed (m/s) = 40 m/s
=> Speed (km/hr) = 40 × 18/5
=> Speed (km/hr) = 8 × 18
=> Speed (km/hr) = 144 km/hr
Therefore The correct answer is 144.
Additional Information
Unit Conversion
To convert speed from m/s to km/hr, multiply by 18/5. To convert km/hr to m/s, multiply by 5/18.
Relative Speed
When two objects move in the opposite direction, relative speed = S1 + S2. In the same direction, relative speed = |S1 − S2|.
Train Crossing Stationary Objects
When a train crosses a pole or a tree, the distance covered is equal to the length of the train itself.

Q40. Answer: (d) 21025

Shortcut Trick
Convert percentages to fractions: 10% = 1/10 and 60% = 3/5.
Net combined multiplier = (1/10) × (3/5) × (2/3) = 6/150 = 1/25.
Given: (1/25) × Number = 841.
Number = 841 × 25 = 21025.
Therefore The correct answer is 21025.
Alternate Method
Given:
10% of 60% of 2/3 of a number = 841
Formula Used:
Value = Base × (Percentage/100) | Fraction of Value = Value × (a/b)
Let the number be x.
=> (10/100) × (60/100) × (2/3) × x = 841
=> (1/10) × (3/5) × (2/3) × x = 841
=> (1 × 3 × 2) / (10 × 5 × 3) × x = 841
=> (6 / 150) × x = 841
=> (1 / 25) × x = 841
=> x = 841 × 25
=> x = 21025
Therefore The correct answer is 21025.
Additional Information
Percentage to Fraction Conversion

To convert a percentage to a fraction, divide by 100 and simplify. Example: 10% = 10/100 = 1/10.

Successive Multipliers

When taking percentages of percentages, simply multiply the respective fractions or decimals together to find the net effect.

Fractional Multiplication

"Of" in mathematical word problems generally translates to multiplication (×). Example: a/b of c = (a/b) × c.

Q41. Answer: (a) Rs. 200

Shortcut Trick

Successive Profit 1 (28%) → CP : SP = 25 : 32

Successive Profit 2 (12.5%) → CP : SP = 8 : 9

Final Ratio (Sohan CP : Rahul CP) = (25 × 8) : (32 × 9) = 200 : 288

Given: Rahul paid Rs. 288 (288 units) => 1 unit = Rs. 1

Sohan CP = 200 units = Rs. 200.

Therefore The correct answer is Rs. 200.

Alternate Method

Given:

Sohan profit = 28%

Ronak profit = 12.5%

Price paid by Rahul = Rs. 288

Formula used:

Final SP = CP × (1 + P1/100) × (1 + P2/100)

=> Let the cost price for Sohan be Rs. x.

=> x × (128/100) × (112.5/100) = 288

=> x × (32/25) × (9/8) = 288

=> x × (4/25) × 9 = 288

=> x × (36/25) = 288

=> x = (288 × 25) ÷ 36

=> x = 8 × 25

=> x = 200

Therefore The correct answer is Rs. 200.

Additional Information

Successive Profit Percentage

If there are two successive profits of a% and b%, the net profit percentage is given by [a + b + (ab/100)]%.

Fractional Equivalents

Using fractions simplifies calculation: 12.5% = 1/8, so a profit of 12.5% means the selling price is (1 + 1/8) = 9/8 of the cost price.

CP and SP Relationship

To find CP when SP and Profit% are known: CP = [SP ÷ (100 + Profit%)] × 100.

Q42. Answer: (d) 40

Shortcut Trick

Total number of observations (n) = 9

Sum of observations = 27 + 36 + 12 + 24 + 48 + 59 + 60 + 80 + 14 = 360

Arithmetic Mean = Sum ÷ n

Mean = 360 ÷ 9 = 40

Therefore The correct answer is 40.

Alternate Method

Given Observations: 27, 36, 12, 24, 48, 59, 60, 80, 14

Formula used: Arithmetic Mean (x) = (Σx_i) ÷ n

=> Sum = 27 + 36 + 12 + 24 + 48 + 59 + 60 + 80 + 14

=> Sum = 360

=> n = 9

=> Arithmetic Mean = 360 ÷ 9

=> Arithmetic Mean = 40

Therefore The correct answer is 40.

Additional Information

Sum of Deviations

The sum of deviations of all observations from their arithmetic mean is always zero: $\Sigma(x_i - x) = 0$.

Effect of Change in Origin

If a constant value k is added to or subtracted from every observation, the mean also increases or decreases by k.

Effect of Change in Scale

If every observation is multiplied or divided by a non-zero constant k, the mean is also multiplied or divided by k.

Weighted Arithmetic Mean

When observations have different weights (w), the mean is calculated as: $x_w = (\Sigma w_i x_i) \div \Sigma w_i$.

Q43. Answer: (b) Rs. 11,100

Shortcut Trick

Extra interest rate = 8% per annum

Total time = 9 years

Total percentage increase in interest = 9 × 8% = 72%

This 72% of Principal = Rs. 7,992

Principal = (7,992 ÷ 72) × 100 = 111 × 100 = Rs. 11,100

Therefore The correct answer is Rs. 11,100.

Alternate Method

Given:

Time (T) = 9 years

Increase in Rate ($R_{(diff)}$) = 8%

Extra Interest fetched = Rs. 7,992

Formula Used:

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

Difference in SI = (P × $R_{(diff)}$ × T) ÷ 100

Calculations:

=> 7,992 = (P × 8 × 9) ÷ 100

=> 7,992 = (P × 72) ÷ 100

=> P = (7,992 × 100) ÷ 72

=> P = 111 × 100

=> P = Rs. 11,100

Therefore The correct answer is Rs. 11,100.

Additional Information

Simple Interest (SI) Properties

Simple interest is calculated only on the principal amount. The interest earned remains the same every year if the rate and principal are constant.

Rate Change Impact

If the rate increases by r% for t years, the total interest increase is simply P × r × t ÷ 100.

Amount Calculation

The total amount (A) after T years is given by A = P + SI = P(1 + RT ÷ 100).

Q44. Answer: (c) 21

Shortcut Trick

Time taken by A alone for single work = (Product of Days) ÷ (Difference of Days)

Time for A = (14 × 6) ÷ (14 − 6) = 84 ÷ 8 = 10.5 days

For double the work, time required = 10.5 × 2 = 21 days

Therefore The correct answer is 21.

Alternate Method

Given:

Time taken by (A + B) = 6 days

Time taken by B = 14 days

Formula used: Efficiency = Total Work ÷ Time taken

Persons	Time	Work	Efficiency
A + B	6	42 (LCM)	7
B	14	3	

=> Total work (LCM of 6 and 14) = 42 units

=> Efficiency of (A + B) = 42 ÷ 6 = 7 units/day

=> Efficiency of B = 42 ÷ 14 = 3 units/day

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

=> Efficiency of A = 7 − 3 = 4 units/day

=> Double the work = 42 × 2 = 84 units

=> Time taken by A alone for double work = 84 ÷ 4 = 21 days

Therefore The correct answer is 21.

Additional Information

Combined Work Formula

If A can do work in x days and B in y days, together they take (x × y) ÷ (x + y) days.

Work and Wages

Wages are distributed in the ratio of the efficiency of the workers: Wage_A : Wage_B = Eff_A : Eff_B.

Pipes and Cisterns

The concept remains the same as Time and Work, where a filling pipe has positive efficiency and a leak has negative efficiency.

Efficiency - Time Relation

Efficiency is inversely proportional to the time taken to complete a specific task (Eff prop. to 1/Time).

Q45. Answer: (d) 25,100

Shortcut Trick

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

MP : CP = (100 + 52) : (100 − 24) = 152 : 76 = 2 : 1

Given, Profit = 52% of CP = Rs. 6,526

CP = 6,526 ÷ 0.52 = Rs. 12,550

Advertised Price (MP) = 2 × 12,550 = Rs. 25,100

Therefore The correct answer is 25,100.

Alternate Method

Given:

Profit% = 52%

Discount% = 24%

Profit Amount = Rs. 6,526

Formula Used:

CP = Profit ÷ Profit%

MP = [CP × (100 + Profit%)] ÷ (100 − Discount%)

=> Profit = 52% of Cost Price (CP) = 6,526

=> CP = 6,526 ÷ 0.52 = 12,550

=> Selling Price (SP) = CP + Profit = 12,550 + 6,526 = 19,076

=> Discount = 24% on Advertised Price (MP)

=> SP = MP × (100 − 24)% = 0.76 × MP

=> 19,076 = 0.76 × MP

=> MP = 19,076 ÷ 0.76 = 25,100

Therefore The correct answer is 25,100.

Additional Information

Relationship between CP and MP

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The direct ratio is given by MP/CP = (100 + Profit%) ÷ (100 − Discount%).

Marked Price (MP)

It is also known as the Advertised Price, List Price, or Printed Price. Discount is always calculated on this value.

Effective Profit with Discount

If an item is marked up by x% and then a discount of y% is given, the net profit% = x − y − (xy ÷ 100).

Q46. Answer: (b) 48 years

Shortcut Trick

Let B present age = x, then A = x + 9.

Age of A in 10 yrs = x + 19; Age of B 10 yrs ago = x − 10.

According to question: x + 19 = 2 × (x − 10).

=> x + 19 = 2x − 20 => x = 39.

Present age of A = 39 + 9 = 48 years.

Therefore The correct answer is 48 years.

Alternate Method

Given:

Difference between A and B = 9 years => A − B = 9

Relation in 10 years: (A + 10) = 2 × (B − 10)

Calculations:

From the first relation, B = A − 9.

Substitute B in the second equation:

=> A + 10 = 2 × ((A − 9) − 10)

=> A + 10 = 2 × (A − 19)

=> A + 10 = 2A − 38

=> 10 + 38 = 2A − A

=> A = 48

Therefore The correct answer is 48 years.

Additional Information

Constant Age Difference

The difference between the ages of two people remains constant regardless of the number of years passed or preceded.

Age Ratio Concept

If the ratio of ages is x:y, their actual ages can be represented as kx and ky, where k is a common constant.

Future and Past Ages

If present age is P, age after n years is P + n and age n years ago was P − n.

Q47. Answer: (a) 994.75 m

Shortcut Trick

In a 30°-60°-90° right-angled triangle, the ratio of sides opposite to the angles is 1 : √3 : 2.

Here, the side opposite to 30° (Height) = 1 unit = 575 m.

The horizontal distance (side opposite to 60°) = √3 units.

Distance = 575 × √3 = 575 × 1.73 = 994.75 m.

Therefore The correct answer is 994.75 m.

Alternate Method

Given: Height of helicopter = 575 m, Angle of elevation (θ) = 30°, √3 = 1.73.

Formula used: tan θ = Perpendicular / Base

=> tan 30° = 575 / x

=> 1 / √3 = 575 / x

=> x = 575 × √3

=> x = 575 × 1.73

=> x = 994.75 m

Therefore The correct answer is 994.75 m.

Additional Information

Trigonometric Ratios

In a right triangle, tan θ = Perpendicular/Base, sin θ = Perpendicular/Hypotenuse, and cos θ = Base/Hypotenuse.

Standard Values of Tan

Common values include tan 30° = 1/√3, tan 45° = 1, and tan 60° = √3.

Angle of Elevation

The angle formed between the horizontal line and the line of sight when looking up at an object.

Q48. Answer: (b) $(y^2)/(4x^{13})$

Shortcut Trick

Separate and group the components: Coefficients, x, and y.

Coefficients: $(2^3 \times 4^3) / (4^4 \times 2^3) = 4^3 / 4^4 = 1/4$

Variable x: x^((2×3) + (−3×3)) / x^((1×4) + (2×3)) = x^(6 − 9) / x^(4 + 6) = x^(−3) / x^(10) = x^(−13)

Variable y: y^((−1×3) + (4×3)) / y^((1×4) + (1×3)) = y^(−3 + 12) / y^(4 + 3) = y^9 / y^7 = y^2

Combining all: (1/4) × x^(−13) × y^2 = y^2 / $4x^{13}$

Therefore The correct answer is y^2 / $4x^{13}$.

Alternate Method

Given expression: $[(2x^2y^{-1})^3 / (4xy)^4] \times [(4x^{-3}y^4)^3 / (2x^2y)^3]$

Formula Used: (a^mb^n)^p = a^(mp)b^(np) | a^m × a^n = a^(m+n) | a^m ÷ a^n = a^(m−n)

=> [(8x^6y^(−3)) / (256x^4y^4)] × [(64x^(−9)y^{12}) / (8x^6y^3)]

=> [8/256 × x^(6−4) × y^(−3−4)] × [64/8 × x^(−9−6) × y^(12−3)]

=> [1/32 × x^2 × y^(−7)] × [8 × x^(−15) × y^9]

=> (1/32 × 8) × x^(2 − 15) × y^(−7 + 9)

=> 1/4 × x^(−13) × y^2

=> y^2 / $4x^{13}$

Therefore The correct answer is y^2 / $4x^{13}$.

Additional Information

Product and Quotient Rules

For any non-zero base 'a', a^m × a^n = a^(m+n) and a^m ÷ a^n = a^(m−n).

Power of a Power Rule

When a power is raised to another power, multiply the exponents: (a^m)^n = a^(mn).

Negative Exponent Rule

A negative exponent indicates a reciprocal: a^(−n) = 1 / a^n.

Power of a Product Rule

Each factor inside the parentheses is raised to the power: $(ab)^n = a^n b^n$.

Q49. Answer: (b) 10 cm2

Shortcut Trick

In a right-angled triangle, the perpendicular sides represent the base and height.

Area = (1/2) × Product of perpendicular sides

Area = (1/2) × 4 × 5

Area = 10 cm^2

Therefore The correct answer is 10 cm^2.

Alternate Method

Given: Perpendicular sides of the triangle are 4 cm and 5 cm.

Formula Used: Area of triangle = (1/2) × Base × Height

=> Base (b) = 4 cm

=> Height (h) = 5 cm

=> Area = (1/2) × 4 × 5

=> Area = 2 × 5

=> Area = 10 cm^2

Therefore The correct answer is 10 cm^2.

Additional Information

Pythagoras Theorem

In a right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides: $a^2 + b^2 = c^2$.

Heron's Formula

For any triangle with sides a, b, and c, Area = $\sqrt{(s(s-a)(s-b)(s-c))}$, where $s = (a+b+c)/2$.

Equilateral Triangle Area

The area of a triangle with all sides equal is Area = $(\sqrt{3} / 4) \times side^2$.

Q50. Answer: (d) 14 : 21 : 33

Shortcut Trick

Multiply the terms of the first ratio by the first term of the second ratio, and the last term of the second ratio by the last term of the first ratio.

A = 4 × 7 = 28

B = 6 × 7 = 42

C = 6 × 11 = 66

A : B : C = 28 : 42 : 66

Divide by 2 => 14 : 21 : 33

Therefore The correct answer is 14 : 21 : 33.

Alternate Method

Given: A : B = 4 : 6 and B : C = 7 : 11

=> To combine ratios, the common term B must have the same value.

=> A : B = (4 × 7) : (6 × 7) = 28 : 42

=> B : C = (7 × 6) : (11 × 6) = 42 : 66

=> A : B : C = 28 : 42 : 66

=> Dividing by the common factor 2:

=> A : B : C = 14 : 21 : 33

Therefore The correct answer is 14 : 21 : 33.

Additional Information

Compound Ratio

For two ratios a : b and c : d, the compound ratio is (a × c) : (b × d).

Mean Proportional

If a, b, and c are in continued proportion such that a : b = b : c, then $b^2 = ac$ or $b = \sqrt{(ac)}$.

Fourth Proportional

If a : b = c : d, then d is the fourth proportional and is calculated as d = (b × c) ÷ a.

Q51. Answer: (a) UUX

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster follows the pattern -1, +4.

Let's check each option:

1. UUX

This letter-cluster does not follow the pattern -1, +4.

2. VUY

This letter-cluster follows the pattern -1, +4.

3. KJN

This letter-cluster follows the pattern -1, +4.

4. CBF

This letter-cluster follows the pattern -1, +4.

Thus, UUX is the odd one out.

Hence, the correct answer is "Option 1".

Q52. Answer: (a) (26, 22, 39)

The logic followed here is:

Logic: (a, b, c) → (a − b) = 4 and (c − a) = 13

25 − 21 = 4 and 38 − 25 = 13

43 − 39 = 4 and 56 − 43 = 13

Let's check each option:

1. (26, 22, 39) → 26 − 22 = 4 and 39 − 26 = 13

2. (39, 35, 18) → 39 − 35 = 4 and 18 − 39 = −21 ≠ 13

3. (32, 36, 53) → 32 − 36 = −4 ≠ 4 and 53 − 32 = 21 ≠ 13

4. (9, 5, 24) → 9 − 5 = 4 and 24 − 9 = 15 ≠ 13

Thus, (26, 22, 39) is the set in which the numbers are related in the same way as the given sets.

Hence, the correct answer is "Option 1".

Q53. Answer: (c) 122

Given: 17 24 38 59 87 ?

The logic followed here is:

17 + 7 = 17 + (7 × 1) = 24

24 + 14 = 24 + (7 × 2) = 38

38 + 21 = 38 + (7 × 3) = 59

59 + 28 = 59 + (7 × 4) = 87

87 + 35 = 87 + (7 × 5) = 122

Thus, 122 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 3".

Q54. Answer: (b) 46

Given: Kavya ranked 32nd from the top and 15th from the bottom in her class.

Kavya's rank from the top = 32nd

Kavya's rank from the bottom = 15th

Total students = Rank from top + Rank from bottom − 1

Total students = 32 + 15 − 1

= 47 − 1

= 46

Thus, there are 46 students are there in the class.

Hence, the correct answer is "Option 2".

Q55. Answer: (b) OQQ42

The position and positional values or English Alphabets are:

Given: CKT60, GMS54, KOR48, ?

The logic followed here is:

Thus, OQQ42 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 2".

Q56. Answer: (a) SINK - ISNK - KNIS

Given:

LAKE - ALKE - EKAL

UGLY - GULY - YLGU

The logic followed here is:

Let's check each option:

1. SINK - ISNK - KNIS

This group of triads follows the same logic.

2. PLAY - PALY - YALP

This group of triads does not follow the same logic.

3. RUNS - URNS - UNSR

This group of triads does not follow the same logic.

4. MEAT - EMAT - TEAM

This group of triads does not follow the same logic.

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Thus, SINK - ISNK - KNIS group of triads follows the same logic.

Hence, the correct answer is "Option 1".

Q57. Answer: (c) 3

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

Now,

Odd numbers, each of which is immediately preceded by an even number and also immediately followed by an even number.

So, the needed pattern is: Even — Odd — Even

Thus, there are 3 odd numbers, each of which is immediately preceded by an even number and also immediately followed by an even number.

Hence, the correct answer is "Option 3".

Q58. Answer: (b) M

Given: Seven boxes, M, N, O, P, Q, R and S, are kept one over the other, but not necessarily in the same order.

1. Only three boxes are kept below N.
2. Only two boxes are kept between N and P.
3. Only Q is kept above O.
4. S is kept at some place below R and at some place above M.

Q
O
R
N
S
M
P

Thus, box M is kept at the second position from the bottom.

Hence, the correct answer is "Option 2".

Q59. Answer: (c) North-east

Given: Town K is to the east of Town L. Town M is to the south of Town K. Town N is to the west of Town M. Town O is to the north of Town N. Town L is to the north-west of Town O.

Thus, Town K is to the North-east of Town O.

Hence, the correct answer is "Option 3".

Q60. Answer: (c) 16 km to the west

Given: Mr. Akai starts from Point A and drives 16 km towards the north. He then takes a left turn, drives 14 km, turns left and drives 19 km. He then takes a left turn and drives 30 km. He takes a final left turn, drives 3 km and stops at Point P.

Thus, he should drive 16 km to the west in order to reach Point A again.

Hence, the correct answer is "Option 3".

Q61. Answer: (a) Two

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

Now,

Even numbers which are immediately followed by odd numbers.

So, the needed pattern is: Even — Odd

Thus, there are two even numbers, each of which are immediately followed by odd numbers.

Hence, the correct answer is "Option 1".

Q62. Answer: (d) 4

Given: Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north.

1. Only one person sits to the left of E.
2. Only two people sit between E and F.

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3. C sits immediately to the right of D.
4. G sits immediately to the left of A.
5. Only one person sits between F and D.

The above statement cannot be satisfied in case I, so it is eliminated.

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

Thus, 4 people sit between A and E.

Hence, the correct answer is "Option 4".

Q63. Answer: (c) 9

Given: Each of the digits in the number 3412687 is arranged in ascending order from left to right.

Second digit from the left = 2

Second digit from the right = 7

Sum = 2 + 7 = 9

Thus, 9 will be the sum of the digits which are second from the left and second from the right in the new number thus formed.

Hence, the correct answer is "Option 3".

Q64. Answer: (d) 107

Given: 42 55 68 81 94 ?

The logic followed here is:

Thus, 107 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 4".

Q65. Answer: (c) 10

Given: If 1 is added to each even digit and 2 is subtracted from each odd digit in the number 7362984.

Second digit from the left = 1

Second digit from the right = 9

Sum = 1 + 9 = 10

Thus, 10 will be the sum of the digits which are second from the left and second from the right in the new number thus formed.

Hence, the correct answer is "Option 3".

Q66. Answer: (c) %

Given: (Left) 7 $ 5 @ 3 ! 3 5 6 7 & % $ 3 # 2 7 + ? > < (Right)

After dropping all the numbers, the remaining series is:

Thus, % is the seventh symbol from the right.

Hence, the correct answer is "Option 3".

Q67. Answer: (c) FNV 26

The position and positional values or English Alphabets are:

Given: BJR 18 CKS 20 DLT 22 EMU 24 ?

The logic followed here is:

Thus, FNV26 will replace the question mark (?) in the given series to make it logically complete.

Hence, the correct answer is "Option 3".

Q68. Answer: (b) 2

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

Now,

Odd numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

So, the needed pattern is: Odd — Odd — Even

Thus, there are 2 odd numbers, each of which is immediately preceded by an odd number and also immediately followed by an even number.

Hence, the correct answer is "Option 2".

Q69. Answer: (a) Daughter

Family Chart:

Decoding the Symbols:

A is				
Symbol	?	=	@	√
Meaning	daughter	son	father	sister
to B				

Given: C √ D ? E @ F = L

It means: C is the sister of D, D is the daughter of E, E is the father of F, F is the son of L.

Thus, C is daughter of L.

Hence, the correct answer is "Option 1".

Q70. Answer: (d) 5

Given: 8 10 7 12 '?' 16

The logic followed here is:

Thus, 5 should come in place of the question mark (?) in the given series.

Hence, the correct answer is "Option 4".

Q71. Answer: (a) gt

Given: In a certain code language, 'hold it together' is coded as 'gt df za' and 'do it together' is coded as 'kl df za'.

Thus, 'hold' is coded as 'gt' in the given language.

Hence, the correct answer is "Option 1".

Q72. Answer: (a) Three

Given: O, P, Q, R, W, X and Y are sitting in a straight line, facing north.

1. Only three people sit to the left of P.
2. Only R sits to the right of Q.
3. Only three people sit between Q and O.
4. X sits at some place to the left of Y but at some place to the right of W.

Thus, three people sit between W and Y.

Hence, the correct answer is "Option 1".

Q73. Answer: (d) PG – NS

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern -3, +12.

Let's check each option:

1. XO – UA

This letter-cluster pair follows the pattern -3, +12.

2. WN – TZ

This letter-cluster pair follows the pattern -3, +12.

3. VM – SY

This letter-cluster pair follows the pattern -3, +12.

4. PG – NS

This letter-cluster pair does not follow the pattern -3, +12.

Thus, PG – NS is the odd one out.

Hence, the correct answer is "Option 4".

Q74. Answer: (d) IP −11

The position and positional values or English Alphabets are:

Given: HO 2 is related to IJ −12 in a certain way. In the same way, FI 5 is related to GD −9.

The logic followed here is:

Similarly,

Thus, HU 3 is related to IP -11, following the same logic.

Hence, the correct answer is "Option 4".

Q75. Answer: (a) QUQ−UYU

The position and positional values or English Alphabets are:

The pattern followed here is:

Each letter-cluster pair follows the pattern +4, +4, +4

OSO−SWS

IMI−MQM

Let's check each option:

1. QUQ–UYU

This letter-cluster pair follows the pattern +4, +4, +4.

2. QTO–TXT

This letter-cluster pair does not follow the pattern +4, +4, +4.

3. QUQ–TYT

This letter-cluster pair does not follow the pattern +4, +4, +4.

4. QTO–UYU

This letter-cluster pair does not follow the pattern +4, +4, +4.

Thus, QUQ−UYU follows the same pattern as the one followed by the two pairs given.

Hence, the correct answer is "Option 1".

Q76. Answer: (d) Only conclusion (I) follows

Statements:

Some fruits are vegetables.

All vegetables are animals.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some animals are fruits. - Follow (Because, some fruits are vegetables and all vegetables are animals, which means some fruits are animals.)

(II) Some fruits are not animals. - Does not follow (Because, some fruits are vegetables and all vegetables are animals, which means some fruits are animals.)

Thus, Only conclusion (I) follows.

Hence, the correct answer is "Option 4".

Q77. Answer: (a) kk

Given: In a certain code language, ‘star bag magic’ is coded as ‘bk kk sm’ and ‘wheat star poem’ is coded as ‘kk tj ew’.

Thus, ‘star’ is coded as 'kk' in that language.

Hence, the correct answer is "Option 1".

Q78. Answer: (d) Both conclusions (I) and (II) follow

Statements:

Some Robins are Penguins.

All Penguins are Magpies.

All Magpies are Eagles.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) All Penguins are Eagles. - Follow (Because, all Penguins are Magpies and all Magpies are Eagles, which means all Penguins are Eagles.)

(II) Some Magpies are Robins. - Follow (Because, some Robins are Penguins and all Penguins are Magpies, which means some Magpies are Robins.)

Thus, Both conclusions (I) and (II) follow.

Hence, the correct answer is "Option 4".

Q79. Answer: (a) Two

Given: O, P, Q, R, W, X, and Y are sitting in a straight line facing the north.

1. No one sits to the right of Q.

2. Only two people sit between Q and P.

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3. P sits to the immediate left of Y.

4. Only three people sit between W and Y.

5. X sits to the immediate right of O.

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

Thus, two people sit between R and X.

Hence, the correct answer is "Option 1".

Q80. Answer: (d) 10

Given: Each of the digits in the number 2716495 is arranged in ascending order from left to right.

First digit from the left = 1

First digit from the right = 9

Sum = 1 + 9 = 10

Thus, 10 will be the sum of the digits that are first from the left and first from the right in the new number thus formed.

Hence, the correct answer is "Option 4".

Q81. Answer: (d) Central Board of Direct Taxes (CBDT)

The correct answer is Central Board of Direct Taxes (CBDT).

Key Points

• The Central Board of Direct Taxes (CBDT) officially launched the Digital Taxpayer Interface System (DTIS) in 2025 as a major step toward digitizing tax administration.

• The primary objective of DTIS is to simplify the Income Tax filing process for both individual and corporate taxpayers by providing a more intuitive and user-friendly interface.

• The system integrates Artificial Intelligence (AI) and Data Analytics to provide pre-filled tax forms, which significantly reduces errors and the time required for Income Tax Return (ITR) submission.

• Through DTIS, the CBDT aims to enhance transparency and accountability in the tax ecosystem, ensuring that taxpayers can track their refunds and notice statuses in real-time.

• This initiative is part of the broader Digital India vision, focusing on "Minimum Government, Maximum Governance" by reducing the need for physical interaction between taxpayers and tax authorities. Hence, the correct answer is Central Board of Direct Taxes (CBDT).

Additional Information

• Central Board of Direct Taxes (CBDT):

• The CBDT is a statutory authority functioning under the Central Board of Revenue Act, 1963.

• It is a part of the Department of Revenue under the Ministry of Finance, Government of India.

• It provides essential inputs for policy and planning of direct taxes in India and is responsible for the administration of direct tax laws through the Income Tax Department.

• The board is headed by a Chairman and comprises six members, each responsible for different domains such as Income Tax & Revenue, Legislation & Computerization, and Investigation.

• Direct vs. Indirect Taxes:

• Direct Taxes are levied directly on the income or wealth of individuals and organizations. Examples include Income Tax and Corporate Tax. These are managed by the CBDT.

• Indirect Taxes are levied on goods and services rather than income. The GST Council and the Central Board of Indirect Taxes and Customs (CBIC) oversee these taxes, including GST, Customs Duty, and Excise Duty.

• NITI Aayog:

• Established on January 1, 2015, replacing the Planning Commission, it serves as the premier policy think tank of the Government of India.

• It provides directional and policy inputs but does not handle the collection or administration of taxes.

• Reserve Bank of India (RBI):

• The RBI is India's central bank, established on April 1, 1935, under the RBI Act, 1934.

• Its primary functions include monetary policy, regulation of the banking sector, and managing foreign exchange, rather than direct tax administration.

Important Points

• Income Tax Act, 1961: This is the fundamental statute that governs the levy, administration, collection, and recovery of Income Tax in India.

• Taxpayers' Charter: Introduced by the CBDT in 2020, it defines the commitment of the Income Tax Department towards taxpayers, emphasizing courtesy, fairness, and reasonableness.

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• E-filing 2.0: Before the launch of DTIS, the Income Tax Department utilized the E-filing 2.0 portal to facilitate electronic filing, which laid the technological groundwork for more advanced systems.

• Permanent Account Number (PAN): A ten-digit alphanumeric identifier issued by the Income Tax Department, which is mandatory for filing tax returns and tracking financial transactions under the DTIS.

Q82. Answer: (d) Rwanda

The correct answer is Rwanda.

Key Points

• In January 2025, the government of Rwanda officially announced its decision to withdraw from the Economic Community of Central African States (ECCAS), also known by its French acronym CEEAC.

• This decision marks the second time Rwanda has exited the bloc; the nation originally left in 2008 to focus on its integration within the East African Community (EAC) and COMESA, only to rejoin ECCAS in 2016.

• The withdrawal is part of a broader strategic shift by Kigali to rationalize its memberships in Regional Economic Communities (RECs), citing the need to avoid overlapping mandates and the financial burden of multiple membership dues.

• The move comes at a time of heightened regional tensions in the Great Lakes region, particularly involving Rwanda, the Democratic Republic of Congo (DRC), and Burundi, which are all prominent members of the organization. Hence, the correct answer is Rwanda.

• The ECCAS Secretariat was formally notified of the decision, which triggers a transition period as per the organization's revised treaty guidelines.

Additional Information

• About ECCAS:

• The Economic Community of Central African States (ECCAS) was established in October 1983 and began functioning in 1985.

• The headquarters of the organization is located in Libreville, Gabon.

• Prior to Rwanda's 2025 withdrawal, the bloc comprised 11 member states: Angola, Burundi, Cameroon, Central African Republic, Chad, Congo, DR Congo, Equatorial Guinea, Gabon, Rwanda, and Sao Tome and Principe.

• The primary objective of ECCAS is to promote regional economic cooperation and establish a Central African Common Market.

• Rwanda's Regional Affiliations:

• Rwanda remains a highly active member of the East African Community (EAC), which it joined in 2007. The EAC is considered one of the most integrated regional blocs in Africa.

• The nation is also a member of the Common Market for Eastern and Southern Africa (COMESA), which facilitates trade across a vast portion of the continent.

• Rwanda joined the Commonwealth of Nations in 2009, despite having no historical colonial ties to the United Kingdom, reflecting its diverse diplomatic outreach.

• Economic Integration Challenges:

• The African Union (AU) has often encouraged member states to limit "multiple memberships" in various RECs to streamline the implementation of the African Continental Free Trade Area (AfCFTA).

• ECCAS has faced significant hurdles in integration due to persistent conflicts in the Congo Basin and varying levels of economic development among its Central African members.

• The 2019 institutional reform of ECCAS aimed to transform the General Secretariat into a Commission to enhance its executive powers and efficiency in conflict resolution.

Q83. Answer: (a) Krishi Nivesh

The correct answer is Krishi Nivesh.

Key Points

• The Krishi Nivesh portal was integrated in June 2025 to serve as a comprehensive, one-stop platform for multiple agriculture-related schemes across various ministries of the Government of India.

• It was designed to facilitate Ease of Doing Business in the agricultural sector by streamlining the application process for various government incentives and subsidies.

• The portal brings together schemes from the Ministry of Agriculture and Farmers Welfare, the Ministry of Food Processing Industries, and other allied departments to promote Agri-infrastructure and investment.

• It aims to provide a seamless interface for Agri-entrepreneurs, Farmer Producer Organizations (FPOs), and cooperatives to access central and state government benefits through a single window.

• By integrating multiple digital platforms, Krishi Nivesh reduces the turnaround time for project approvals and enhances the transparency of the fund disbursement process.

Additional Information

• Scope of Integration: The portal covers a wide range of programs, including the Agriculture Infrastructure Fund (AIF), the

National Livestock Mission, and the Mission for Integrated Development of Horticulture (MIDH).

• Target Beneficiaries: It primarily targets Individual Farmers, Startups, Micro, Small, and Medium Enterprises (MSMEs), and large-scale Agri-businesses looking to invest in the rural economy.

• Digital Infrastructure: The Krishi Nivesh portal utilizes Real-time Analytics and Project Tracking features to help the government monitor the implementation of schemes at the District and State levels.

• Economic Impact: The integration is expected to boost domestic investment and Foreign Direct Investment (FDI) in the post-harvest management and processing sectors, leading to better value addition for farmers' produce.

• User Accessibility: The platform provides detailed information on eligibility criteria, necessary documentation, and financial assistance limits for each integrated scheme in multiple regional languages.

Important Points

• Convergence of Schemes: One of the primary objectives of the portal in 2025 is to ensure Convergence, preventing the duplication of efforts across different government departments.

• Application Lifecycle: Once a user registers on Krishi Nivesh, they are provided with a Unique Tracking ID, which allows them to monitor their application status from submission to the Sanction of Funds.

• Nodal Agency: The Ministry of Agriculture acts as the primary oversight body, ensuring that the portal remains updated with the latest Policy Guidelines and interest subvention rates.

• Agri-Sops: The portal also highlights specific Sops (incentives) provided for Organic Farming, Precision Agriculture, and the Digital Agriculture Mission.

Q84. Answer: (b) Chairmanship for 2025–26

The correct answer is Chairmanship for 2025–26.

Key Points

• India has assumed the Chairmanship of the Asian Productivity Organization (APO) for the year 2025–26, marking a significant leadership milestone for the country in the regional productivity movement.

• The announcement was made during the 67th Session of the Governing Body (GBM) of the APO, which was held in May 2025. Hence, the statement regarding Chairmanship for 2025–26 is correct.

• India succeeded the Republic of Korea in this role, having previously served as the First Vice-Chair for the 2024–25 term.

• The Secretary of the Department for Promotion of Industry and Internal Trade (DPIIT), under the Ministry of Commerce and Industry, represents India as the APO Director on the Governing Body.

• This leadership position allows India to play a pivotal role in steering the APO Vision 2025, which focuses on innovation-led productivity and inclusive development across the Asia-Pacific region.

Additional Information

• Asian Productivity Organization (APO):

• The APO is an intergovernmental organization established on 11 May 1961 with the objective of enhancing productivity as a stepping stone to socio-economic development.

• It is headquartered in Tokyo, Japan, and currently comprises 21 member economies from the Asia-Pacific region.

• The organization provides technical advisory services, conducts research, and facilitates capacity building in sectors such as agriculture, industry, and services.

• India's Role and Nodal Agency:

• India is one of the founding members of the APO and has been an active participant in its initiatives since 1961.

• The National Productivity Council (NPC), an autonomous body under DPIIT, serves as the National Productivity Organization (NPO) for India to implement APO programs.

• The NPC works to promote productivity culture in India through consultancy, training, and research.

• Key Themes and Focus Areas:

• The APO currently emphasizes Green Productivity (GP), Digital Transformation, and Smart Manufacturing to help members remain competitive in the global market.

• India’s chairmanship is expected to focus on MSME growth, sustainable agriculture, and leveraging Artificial Intelligence (AI) for productivity gains.

Important Points

• The Governing Body is the supreme organ of the APO, consisting of Directors designated by each member government. It meets annually to decide on policy matters, budgets, and programs.

• Assumption of the Chairmanship by India after nearly two decades highlights the country's growing influence in global economic governance and its commitment to regional cooperation.

• During the May 2025 meeting, the APO members also discussed the post-2025 strategy, focusing on resilient supply chains and carbon neutrality.

Q85. Answer: (d) Electronics Component Manufacturing Scheme

The correct answer is Electronics Component Manufacturing Scheme.

Key Points

• The Electronics Component Manufacturing Scheme, officially known as the Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS), was notified by the Ministry of Electronics and Information Technology (MeitY) in April 2020.

• The primary objective of this scheme is to strengthen the value chain for the manufacturing of electronic components, semiconductors, modules, and sub-assemblies within India. Hence, option 4 is correct.

• It provides a financial incentive of 25% on capital expenditure for the identified list of electronic goods that comprise the downstream value chain.

• This scheme targets the offset of disability for domestic manufacturing of components and helps in creating a robust ecosystem for Electronic System Design and Manufacturing (ESDM) in the country.

• The scheme covers a wide range of products including Passive components, Active components, PCBs, Sensors, Transducers, and Display assembly.

Additional Information

• Make in India Initiative:

• Launched in September 2014, it is a major national program designed to facilitate investment, foster innovation, and build best-in-class manufacturing infrastructure.

• It covers 27 sectors, including both manufacturing and services, but it is a broad policy framework rather than a specific scheme for electronic component sub-assemblies. Hence, option 1 is incorrect.

• Digital India Programme:

• Launched on July 1, 2015, this flagship program aims to transform India into a digitally empowered society and a knowledge economy.

• The focus is on providing digital infrastructure as a utility to every citizen and governance on demand, rather than specific hardware manufacturing incentives. Hence, option 2 is incorrect.

• Production Linked Incentive (PLI) Scheme:

• The PLI Scheme for Large Scale Electronics Manufacturing was launched in 2020 to provide incentives on incremental sales of goods manufactured in India.

• While it supports electronics, its primary focus is on Mobile Phones and Specified Electronic Components at a larger assembly scale, whereas SPECS is dedicated to the foundational component ecosystem and capital expenditure. Hence, option 3 is incorrect.

Important Points

• National Policy on Electronics (NPE) 2019: This policy aims to position India as a global hub for ESDM by encouraging and driving capabilities in the country for developing core components, including chipsets.

• Targets: The government aims to achieve a turnover of $400 Billion in the electronics manufacturing sector by 2025.

• Modified Electronics Manufacturing Clusters (EMC 2.0): Launched alongside SPECS, this scheme provides support for creating world-class infrastructure along with common facilities and amenities.

• Economic Impact: By focusing on components, the Electronics Component Manufacturing Scheme aims to reduce import dependence and increase domestic value addition from approximately 15-20% to much higher levels.

Q86. Answer: (c) Retrospective environmental clearances

The correct answer is Retrospective environmental clearances.

Key Points

• On 16 May 2025, the Supreme Court of India delivered a significant verdict striking down the government provisions that allowed for Retrospective environmental clearances.

• Retrospective clearances, often referred to as ex post facto approvals, allowed industrial and developmental projects to begin operations without obtaining prior mandatory environmental permissions, seeking regularisation at a later stage.

• The Apex Court observed that allowing such clearances is fundamentally contrary to the Precautionary Principle and the core objectives of the Environment (Protection) Act, 1986.

• The ruling emphasized that environmental impact must be assessed before the commencement of any activity to prevent irreversible damage to the ecosystem and biodiversity.

• By striking down these provisions, the Supreme Court aimed to ensure that the Environmental Impact Assessment (EIA) process is not rendered a mere formality or a bureaucratic "fait accompli" for illegal projects.

Additional Information

• Environmental Impact Assessment (EIA):

• It is a statutory process used to evaluate the potential environmental consequences of a proposed project before it is granted

Environmental Clearance (EC).

• In India, the EIA Notification was first issued in 1994 and subsequently replaced by a more comprehensive notification in 2006.

• The process involves screening, scoping, public consultation, and appraisal by the Expert Appraisal Committee (EAC).

• The Precautionary Principle:

• This is a fundamental pillar of International Environmental Law and Indian jurisprudence, suggesting that where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

• The Supreme Court has integrated this into Article 21 of the Constitution of India as part of the Right to Life, which includes the right to a healthy environment.

• Polluter Pays Principle:

• This principle mandates that the cost of pollution should be borne by those who cause it. In cases of ex post facto clearances, the court has often imposed heavy environmental compensation on violators.

• MoEFCC:

• The Ministry of Environment, Forest and Climate Change is the nodal agency responsible for implementing environmental policies and granting clearances for Category A projects at the national level.

Important Points

• Legal Doctrine: The Supreme Court has consistently maintained in various judgments (such as in the Alembic Pharmaceuticals case) that the concept of ex post facto environmental clearance is alien to environmental jurisprudence.

• Sustainable Development: The court highlights that economic growth cannot be pursued at the cost of the environment; rather, Sustainable Development requires a balance where ecological integrity is maintained for future generations.

• Administrative Impact: This judgment forces the government to tighten the compliance mechanisms and ensures that no project can bypass the mandatory public hearing and scientific assessment stages before breaking ground.

Q87. Answer: (a) Bharatiya Bhasha Pustak Scheme

The correct answer is Bharatiya Bhasha Pustak Scheme.

Key Points

• The Bharatiya Bhasha Pustak Scheme was officially announced by the Union Finance Minister Nirmala Sitharaman during the presentation of the Union Budget 2025–26 on February 1, 2025.

• The primary objective of this scheme is to promote Indian language books by facilitating their availability in digital form, ensuring that India's rich literary heritage is accessible to the tech-savvy younger generation.

• It aims to bridge the gap between traditional literature and modern digital platforms, encouraging the consumption of content in regional languages such as Hindi, Tamil, Bengali, Marathi, and others.

• The scheme is a strategic move to support vernacular authors and publishers, helping them transition into the digital publishing ecosystem through government-backed incentives and infrastructure.

• By digitizing books, the government intends to enhance literacy and knowledge dissemination across diverse linguistic groups, aligning with the vision of Viksit Bharat.

Additional Information

• National Education Policy (NEP) 2020 Connection:

• The NEP 2020 strongly advocates for education in mother tongues and regional languages to improve cognitive development.

• The Bharatiya Bhasha Pustak Scheme acts as a supporting pillar for NEP 2020 by providing the necessary digital resources for students and educators in their local languages.

• Digital Public Infrastructure (DPI):

• The scheme is expected to utilize India’s robust Digital Public Infrastructure to host e-books, making them accessible via mobile apps and web portals.

• It integrates with the Digital India mission to ensure that language is not a barrier to accessing quality literature and educational materials.

• Role of Bhashini:

• The government’s AI-based translation platform, Bhashini, may play a crucial role in translating and digitizing existing works into multiple Indian languages.

• This technological synergy helps in creating a multilingual digital library that caters to the diverse population of the country.

• Budget 2025-26 Focus:

• The Union Budget 2025-26 emphasized innovation, digital transformation, and cultural preservation as key drivers for economic and social growth.

• A significant portion of the educational budget was directed toward digital learning and the development of vernacular content.

Important Points

• Preservation of Culture: Digitizing books in Indian languages ensures the long-term preservation of rare manuscripts and classical literature that are currently in physical formats prone to decay.

• Global Reach: Making Indian literature available in digital form allows the Indian diaspora and global readers to access and appreciate the cultural diversity of India easily.

• Economic Impact: The scheme is expected to boost the publishing industry in India by creating new revenue streams through e-books and digital subscriptions for regional language content.

• Inclusivity: By focusing on digital Indian language books, the government ensures that people in rural areas, who primarily speak regional languages, are not left behind in the digital revolution.

Q88. Answer: (c) Doha, Qatar

The correct answer is Doha, Qatar.

Key Points

• The United Nations General Assembly has decided to convene the Second World Summit for Social Development, which is scheduled to be held in Doha, Qatar.

• The summit is slated to take place from 4 to 6 November 2025, marking a significant milestone in global social policy.

• The decision to hold this summit was formalized through UN General Assembly resolution 78/173, which emphasizes the need to address emerging challenges in social development.

• The primary objective of the 2025 Summit is to evaluate progress made since the inaugural summit and to recommit to the principles of social justice and equity.

• It aims to provide a renewed momentum for the implementation of the Copenhagen Declaration on Social Development and the Programme of Action.

Additional Information

• The First World Summit for Social Development:

• The First World Summit was held in Copenhagen, Denmark, in March 1995.

• It was the largest gathering of world leaders at that time specifically focused on social development issues.

• The summit resulted in the Copenhagen Declaration, where 117 heads of state pledged to make poverty eradication, full employment, and social integration the overriding objectives of development.

• Alignment with the 2030 Agenda:

• The Second World Summit in Doha is strategically aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda.

• It seeks to address the "missing link" in global development by focusing on human-centric policies that ensure no one is left behind.

• Current global crises, including the aftermath of the COVID-19 pandemic, economic instability, and climate change, have necessitated this high-level meeting.

• The Role of Qatar:

• Qatar has increasingly become a hub for international diplomacy and high-level United Nations conferences.

• Hosting the summit in Doha highlights the Middle East's growing influence in shaping global social and economic discourse.

• The summit is expected to produce a political declaration that will guide international efforts for the next decade.

Important Points

• Key Themes: The summit will focus on social protection systems, decent work, and reducing inequalities within and among countries.

• Poverty Eradication: A central pillar remains the eradication of poverty in all its forms and dimensions, which is SDG 1.

• Global Social Contract: Discussions are expected to revolve around the concept of a "New Global Social Contract" proposed by the UN Secretary-General in the "Our Common Agenda" report.

• Preparatory Process: The United Nations Department of Economic and Social Affairs (UN DESA) is playing a lead role in the preparatory stages, ensuring inclusive participation from civil society and non-governmental organizations.

Q89. Answer: (b) The Lancet Countdown on Health and Climate Change

The correct answer is The Lancet Countdown on Health and Climate Change.

Key Points

• The Lancet Countdown on Health and Climate Change released its global report in October 2024/2025, highlighting the severe impacts of air pollution and climate change on human mortality.

• According to the report, human-caused PM2.5 pollution was responsible for more than 1.7 million deaths in India during the year 2022.

• The assessment indicates that the burning of fossil fuels (like coal and oil) is the primary driver of this toxic particulate matter, which penetrates deep into the respiratory system.

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• The report emphasizes that global health is being threatened by the continued use of dirty energy, leading to a rise in respiratory diseases, strokes, and heart attacks.

• In the context of India, the report notes that air pollution levels consistently exceed World Health Organization (WHO) guidelines, making it one of the most affected countries globally.

Additional Information

• Understanding PM2.5:

• PM2.5 refers to particulate matter with a diameter of less than 2.5 micrometers, which is about 3% of the diameter of a human hair.

• Due to its small size, it can travel deep into the lungs and enter the bloodstream, causing systemic health issues.

• Major sources in India include vehicle emissions, industrial combustion, crop burning, and construction dust.

• The Lancet Countdown:

• It is an international, multidisciplinary collaboration that monitors the emerging health profiles of climate change.

• It tracks over 50 indicators across five key domains, including health impacts, adaptation, and mitigation actions.

• The collaboration includes experts from University College London (UCL) and over 50 other academic institutions and UN agencies.

• Health Impacts in India:

• Aside from PM2.5, India is witnessing a surge in heat-related mortality, with deaths among people over age 65 increasing significantly over the last decade.

• The report also warns about the increasing suitability for the transmission of infectious diseases like Dengue and Malaria due to changing climatic conditions.

Important Points

• Economic Burden: The 1.7 million deaths in 2022 also translated into massive economic losses for India, equivalent to a significant percentage of its GDP due to lost productivity and healthcare costs.

• Global Context: Globally, the report highlighted that deaths attributed to fossil fuel-derived PM2.5 have seen varying trends, but India remains a hotspot for pollution-related mortality.

• Policy Recommendations: The Lancet Countdown advocates for a rapid transition to renewable energy (like solar and wind) to achieve net-zero emissions and save millions of lives.

• Data Fact: In India, the National Clean Air Programme (NCAP) was launched in 2019 to reduce particulate matter concentration by 20-30% by 2024 (later revised to 40% by 2026), yet challenges remain in meeting these targets.

Q90. Answer: (d) PARIVESH 2.0

The correct answer is PARIVESH 2.0.

Key Points

• In February 2025, the Union Ministry of Environment, Forest and Climate Change (MoEFCC) introduced enhanced features on the PARIVESH 2.0 platform to streamline and accelerate the processing of forest clearances.

• The PARIVESH 2.0 portal functions as a Single-Window Integrated Environmental Management System, providing a unified interface for project proponents to apply for Environment, Forest, Wildlife, and CRZ clearances.

• The new updates focus on the digital transformation of the appraisal process, minimizing physical touchpoints and reducing the turnaround time for approvals related to infrastructure and industrial projects.

• The platform integrates a Geographic Information System (GIS) based decision support tool, which allows authorities to analyze geospatial data, forest density, and proximity to protected areas with higher precision.

• By automating stage-wise monitoring, the system ensures accountability and transparency in the decision-making process between the State Forest Departments and the Central Government.

Additional Information

• Understanding PARIVESH:

• The acronym stands for Pro-Active and Responsive facilitation by Interactive, Virtuous and Environmental Single-window Hub.

• It was initially launched in August 2018 by the Government of India to simplify the regulatory landscape for environmental approvals.

• The transition to PARIVESH 2.0 represents a shift toward Next-Generation technology, incorporating Data Analytics and Cloud-based infrastructure for better data management.

• Regulatory Framework:

• Forest clearances are primarily governed by the Forest (Conservation) Act, 1980, which mandates prior central approval for the diversion of forest land for non-forestry purposes.

• The portal helps in the enforcement of the Environment (Protection) Act, 1986 and the Wildlife (Protection) Act, 1972 by ensuring all projects meet statutory environmental norms.

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• Integration with National Initiatives:

• The platform is closely linked with the PM Gati Shakti National Master Plan, aimed at integrated planning and coordinated implementation of infrastructure connectivity projects across India.

• It supports the Ease of Doing Business index by providing real-time tracking of applications and automatic alerts via SMS and email to stakeholders.

• Technical Development:

• The portal is designed and developed by the National Informatics Centre (NIC) in collaboration with the MoEFCC.

• It utilizes Remote Sensing data to verify the status of compensatory afforestation land and existing green cover.

Important Points

• Impact on Timelines: Before the implementation of such digital hubs, environmental and forest clearances often took over 600 days; however, the PARIVESH workflow has significantly reduced this to less than 180 days for many categories.

• Scope of Clearances:

• Environment Clearance (EC): Required for projects listed in the EIA Notification, 2006.

• Forest Clearance (FC): Required for projects involving any forest land.

• Wildlife Clearance (WC): Mandatory if a project is located within or near a National Park or Wildlife Sanctuary.

• CRZ Clearance: Necessary for projects in Coastal Regulation Zones.

• User Accessibility: The system provides a Common Application Form (CAF), ensuring that users do not have to enter the same project details multiple times for different types of clearances.

Q91. Answer: (b) International Cricket Council

The correct answer is International Cricket Council.

Key Points

• The International Cricket Council (ICC) is the global governing body for the sport of cricket, overseeing international competitions and ranking systems.

• It was originally founded as the Imperial Cricket Conference on 15 June 1909 by representatives from England, Australia, and South Africa.

• The organization underwent a name change in 1965 to become the International Cricket Conference, before finally adopting its current name, the International Cricket Council, in 1987.

• The primary role of the ICC is to organize major world championship events, most notably the ICC Men's Cricket World Cup, the ICC T20 World Cup, and the ICC World Test Championship.

• The ICC is also responsible for the appointment of Umpires and Match Referees who officiate at all sanctioned Test matches, One Day Internationals (ODIs), and Twenty20 Internationals.

Additional Information

• Headquarters: For nearly a century, the ICC was headquartered at Lord's Cricket Ground in London. However, in August 2005, it moved its headquarters to Dubai, United Arab Emirates, primarily for tax reasons and to be more centrally located among its global members.

• Membership: The ICC currently has 108 member nations. This includes 12 Full Members who play Test matches and 96 Associate Members who participate in various qualifying structures.

• Full Members: These include nations like India, Australia, England, Pakistan, South Africa, New Zealand, West Indies, Sri Lanka, Bangladesh, Zimbabwe, Ireland, and Afghanistan.

• BCCI Relation: In the context of India, the Board of Control for Cricket in India (BCCI) is the national governing body that represents India at the ICC. Option 4, Indian Cricket Council, is often confused with the BCCI.

• Leadership: The ICC is led by a Chairman and a Chief Executive Officer (CEO). For example, Greg Barclay took office as the Chairman in 2020, and Geoff Allardice serves as the CEO.

Important Points

• Laws of Cricket: While the ICC administers the game, it does not actually own the copyright to the Laws of Cricket. The Marylebone Cricket Club (MCC) in London remains the custodian and author of the laws, though the ICC develops the Standard Playing Conditions for international matches.

• Integrity and Ethics: The ICC operates an Anti-Corruption Unit (ACU) to combat match-fixing and spot-fixing, ensuring the integrity of the sport remains intact globally.

• Development: The ICC Development Program aims to grow the game in non-traditional cricket-playing regions, providing funding and infrastructure support to Associate Members.

• Revenue Model: The ICC generates significant revenue through the sale of broadcasting rights for its major events, which is then distributed among its member nations to support the growth of the game at the grassroots level.

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Q92. Answer: (b) Deepali Deshpande

The correct answer is Deepali Deshpande.

Key Points

• The Ministry of Youth Affairs and Sports announced the National Sports Awards for the year 2024, which were conferred by the President of India at Rashtrapati Bhavan in early 2025.

• Deepali Deshpande was honored with the Dronacharya Award in the Regular Category for her exceptional contribution to Shooting.

• As a high-performance coach, she played a pivotal role in training elite Indian shooters, most notably Swapnil Kusale, who secured a Bronze medal in the 50m Rifle 3 Positions at the Paris 2024 Olympics.

• She has also mentored other prominent athletes such as Sift Kaur Samra, a world record holder and Asian Games Gold medalist, and Anjum Moudgil.

• Other recipients in the Regular Category for the 2025 presentation included Sandeep Sangwan for Wrestling and S Muralidharan for Badminton.

Additional Information

• Dronacharya Award:

• Instituted in 1985, it is awarded to coaches who have produced outstanding results at International sports events.

• The award is named after Guru Drona, a character from the Indian epic Mahabharata.

• It consists of a bronze statuette of Dronacharya, a certificate, ceremonial dress, and a cash prize.

• Award Categories and Prize Money:

• The Regular Category carries a cash prize of Rs. 10 lakh.

• The Lifetime Category, meant for coaches who have contributed to sports promotion for 20 years or more, carries a cash prize of Rs. 15 lakh.

• In the 2025 cycle, Subhash Rana received the Dronacharya Award (Lifetime Category) for Shooting.

• Deepali Deshpande's Career:

• She is a former Olympian rifle shooter who represented India at the 2004 Athens Olympics.

• She won a Silver medal at the Asian Shooting Championships in 2004 held in Kuala Lumpur.

• Transitioning into coaching, she became one of India's most respected mentors in Rifle Shooting.

Important Points

• The selection committee for the National Sports Awards 2024-25 was headed by Justice (Retd.) A. M. Khanwilkar.

• The awards recognize excellence in various categories including Major Dhyan Chand Khel Ratna Award, Arjuna Award, and Dronacharya Award.

• The Dronacharya Award is the highest recognition for sports coaching in India, ensuring that the mentors behind the athletes receive state-level validation for their hard work and strategy.

Q93. Answer: (b) Chhattisgarh

p>The correct answer is Chhattisgarh.

Key Points

• Prime Minister Narendra Modi inaugurated the 'Shanti Shikhar' centre in November 2025, marking a significant milestone in the spiritual infrastructure of Central India.

• The centre is located in Nava Raipur, which serves as the planned administrative capital of the state of Chhattisgarh.

• Shanti Shikhar is designed as a modern facility dedicated to spiritual learning, peace, and meditation, aimed at fostering mental well-being and social harmony.

• The establishment of this centre is an initiative by the Brahma Kumaris, a prominent global spiritual movement that focuses on personal transformation and world renewal.

• The inauguration highlights the government's support for institutions that promote holistic health and value-based education within the country.

Additional Information

• Brahma Kumaris World Spiritual University:

• It is an international non-governmental spiritual organization founded by Lekhraj Kripalani (known as Brahma Baba) in 1936.

• The organization is headquartered in Mount Abu, Rajasthan, India.

• It is known for its focus on Raja Yoga meditation and is one of the largest spiritual organizations in the world led primarily by women.

• Nava Raipur (Atal Nagar):

• It is India's first greenfield smart city and the fourth planned capital city in the country after Chandigarh, Gandhinagar, and

Bhubaneswar.

• In 2018, the city was renamed Atal Nagar in honor of the former Prime Minister Atal Bihari Vajpayee.

• The city is designed with a focus on sustainability, featuring integrated infrastructure and a large percentage of green cover.

• State of Chhattisgarh:

• Chhattisgarh was formed on 1st November 2000, by partitioning the sixteen Chhattisgarhi-speaking districts of Madhya Pradesh.

• It is often referred to as the "Rice Bowl of India" due to its high rice production and the variety of rice species grown in the region.

• The state is rich in mineral resources, including coal, iron ore, and bauxite, contributing significantly to India's industrial sector.

• Spiritual Tourism and Wellness:

• The inauguration of centers like Shanti Shikhar aligns with India's broader push to promote spiritual tourism and wellness centers as part of the Swadesh Darshan and PRASHAD schemes.

• Such centers attract both domestic and international visitors seeking yoga, meditation, and traditional Indian spiritual wisdom.

Q94. Answer: (c) IIT Madras

The correct answer is IIT Madras.

Key Points

• The Indian Navy officially inducted a uniquely constructed Ancient Stitched Ship on 21 May 2025 at the Karwar Naval Base (INS Kadamba) in Karnataka.

• IIT Madras is the primary technical partner for this prestigious project, providing specialized expertise in naval architecture, structural design, and historical validation of the vessel's seaworthiness.

• The construction of this ship is a collaborative effort between the Ministry of Culture and the Indian Navy to revive and preserve India’s 2,000-year-old maritime heritage.

• This vessel is built using the ancient stitching technique, where wooden planks are joined together using coir ropes and resins instead of modern iron nails or metal fasteners.

• The project aims to demonstrate the seafaring prowess of ancient India by sailing the vessel from Mandvi in Gujarat to Muscat in Oman, retracing historical trade routes influenced by the Monsoon winds.

Additional Information

• Significance of Stitched Ships:

• Stitched ships were the backbone of trade in the Indian Ocean region before the arrival of European ship-building techniques.

• The use of coir (coconut fiber) for stitching provided flexibility to the hull, allowing ships to withstand the impact of coral reefs and shallow waters better than rigid nailed ships.

• Traditional shipbuilders, or 'Sutradhars', from Goa and other coastal regions were involved in the actual construction to ensure authenticity.

• Role of IIT Madras:

• The Department of Ocean Engineering at IIT Madras used computational fluid dynamics (CFD) and modern hydrodynamic simulations to ensure the ship could handle high-sea conditions.

• They provided the technical documentation and safety protocols required for the vessel to be certified for international waters.

• Project Mausam:

• This initiative aligns with Project Mausam, a Ministry of Culture project designed to re-establish India's ancient ties with its neighbors in the Indian Ocean world, including East Africa, the Arabian Peninsula, and Southeast Asia.

• The voyage to Oman symbolizes the deep-rooted maritime diplomacy and cultural exchange that defined the Silk Route of the sea.

• Karwar Naval Base (INS Kadamba):

• It is one of the largest naval bases in India and serves as the home port for the aircraft carrier INS Vikramaditya.

• The induction ceremony held here highlights the integration of ancient technology with modern strategic infrastructure.

Important Points

• The ship measures approximately 20 meters in length and was constructed using Malabar Teak, known for its durability and water resistance.

• The upcoming transoceanic voyage will be navigated by a crew of Indian Navy personnel using traditional tools like the Kamal (an ancient celestial navigation device) alongside modern safety equipment.

• The total cost of the project is estimated to be around 9 crore rupees, funded largely through the Ministry of Culture to promote maritime archaeology.

Q95. Answer: (a) 3.7%

The correct answer is 3.7%.

Key Points

• The Reserve Bank of India (RBI), during its monetary policy review in June 2025, released its updated economic projections, placing the average Consumer Price Index (CPI) inflation for the fiscal year 2025-26 (FY26) at 3.7%.

• This forecast indicates the central bank's expectation that inflation will remain below its medium-term target of 4.0% on a durable basis, reflecting a stabilizing trend in the economy.

• The Monetary Policy Committee (MPC) arrived at this 3.7% figure after considering several macroeconomic variables, including global commodity prices, monsoon prospects, and the domestic supply-demand balance.

• The projection for FY26 typically includes a quarterly breakdown where inflation is expected to fluctuate, but the annual average is maintained at the forecasted level to guide monetary policy decisions.

• A forecast of 3.7% allows the RBI more flexibility in managing interest rates, as it suggests that price pressures are well-contained within the mandated tolerance band of 2% to 6%.

Additional Information

• Consumer Price Index (CPI):

• In India, the CPI is the primary measure used by the RBI to track inflation and set monetary policy. It measures the change in the price level of a weighted average market basket of consumer goods and services purchased by households.

• The National Statistical Office (NSO), under the Ministry of Statistics and Programme Implementation (MoSPI), releases the CPI data on a monthly basis.

• Monetary Policy Committee (MPC):

• The MPC is a statutory body constituted under the Reserve Bank of India Act, 1934. It consists of six members, including the RBI Governor, who acts as the ex-officio chairperson.

• The primary objective of the MPC is to maintain price stability while keeping in mind the objective of economic growth.

• Inflation Targeting Framework:

• The Government of India, in consultation with the RBI, sets an inflation target every five years. Currently, the target is 4% with a tolerance band of +/- 2% (i.e., a range of 2% to 6%).

• If the average inflation remains outside this 2-6% range for three consecutive quarters, the RBI is considered to have failed its mandate and must provide a report to the government.

• Repo Rate and Inflation:

• The Repo Rate is the benchmark interest rate at which the RBI lends money to commercial banks.

• To control high inflation, the MPC typically increases the Repo Rate to reduce liquidity in the market. Conversely, if inflation is low (like the 3.7% forecast for FY26), the RBI may consider maintaining or lowering the rate to stimulate investment and consumption.

• Headline vs. Core Inflation:

• Headline Inflation refers to the total inflation in an economy, including volatile items like food and fuel.

• Core Inflation is calculated by excluding the volatile food and fuel components from the headline inflation, providing a clearer picture of the long-term inflation trend.

Important Points

• The forecast for FY26 was established during the second quarter of the 2025 calendar year.

• Factors such as the Base Effect (the impact of the price level in the corresponding period of the previous year) play a significant role in determining the CPI trajectory.

• Global crude oil prices are a major external factor; any surge in international prices can potentially push the 3.7% forecast higher due to imported inflation.

• Fiscal Policy measures taken by the Government of India, such as buffer stock management for grains and import duty adjustments on edible oils, work in tandem with the RBI's monetary policy to achieve the inflation target.

Q96. Answer: (d) Mansukh Mandaviya

The correct answer is Mansukh Mandaviya.

Key Points

• The Union Minister for Youth Affairs and Sports, Dr. Mansukh Mandaviya, officially inaugurated the Fit India Carnival 2025.

• The grand event was organized at the Major Dhyan Chand National Stadium in New Delhi on January 10, 2025.

• The carnival is a three-day celebration of fitness, wellness, and indigenous sports, scheduled to run from January 10 to January 12, 2025.

• The primary objective of this event is to further the vision of the Fit India Movement by encouraging Jan Bhagidari (public participation) in health-related activities.

• During the inauguration, Dr. Mansukh Mandaviya emphasized that a fit and healthy youth is the cornerstone of achieving the Viksit Bharat @2047 goal.

Additional Information

• Fit India Movement:

• Launched by Prime Minister Narendra Modi on August 29, 2019, on the occasion of National Sports Day.

• It aims to make fitness an integral part of the daily lives of Indians by encouraging simple lifestyle changes and physical activity.

• Mansukh Mandaviya:

• He serves as the Union Minister for Labour and Employment as well as Youth Affairs and Sports.

• He has played a vital role in integrating fitness initiatives with youth development programs across the country.

• Major Dhyan Chand National Stadium:

• Located in New Delhi, it is named after the legendary Indian hockey player Major Dhyan Chand.

• It serves as a premier venue for national and international sporting events and was the main stadium for the first Asian Games in 1951.

• National Sports Day:

• Observed every year on August 29 in India to commemorate the birth anniversary of Major Dhyan Chand, often referred to as the "Wizard of Hockey."

Important Points

• Event Highlights: The Fit India Carnival 2025 featured various activities such as Yoga sessions, Zumba, traditional Indian sports like Mallakhamb and Kabaddi, and fitness workshops.

• Mascot and Promotion: The event utilized various digital and physical platforms to promote the message of "Fitness ki Dose, Aadha Ghanta Roz" (A dose of fitness, half an hour every day).

• Youth Participation: Thousands of school children, fitness enthusiasts, and athletes participated in the carnival to showcase their commitment to a healthy lifestyle.

• Government Integration: The Ministry has collaborated with several departments to ensure that fitness centers and open gyms are accessible to the public in both urban and rural areas.

Q97. Answer: (d) Indore

The correct answer is Indore.

Key Points

• The city of Indore, located in Madhya Pradesh, has established a state-of-the-art green waste processing plant based on the Public-Private Partnership (PPP) model under the Swachh Bharat Mission-Urban (SBM-U).

• This facility commenced its first batch of trial production in March 2025, marking a significant milestone in urban waste management and circular economy initiatives.

• The plant is designed to process horticultural waste, such as tree prunings, leaves, and garden trimmings, which were previously a challenge to manage in traditional composting units.

• Under the PPP model, the Indore Municipal Corporation (IMC) provided the land at the Devguradia waste disposal site, while the private partner invested in the machinery and technology for processing.

• The output of this green waste plant includes bio-coal or high-quality briquettes, which serve as a sustainable alternative to fossil fuels in industrial boilers and furnaces.

Additional Information

• Swachh Bharat Mission-Urban (SBM-U) 2.0:

• Launched on October 1, 2021, by Prime Minister Narendra Modi, this phase aims to make all Indian cities 'Garbage Free' over a period of five years.

• It focuses on source segregation of solid waste, utilizing the 3Rs (Reduce, Reuse, Recycle) principle, and scientific processing of all types of municipal solid waste.

• Indore's Waste Management Success:

• Indore has been recognized as India's Cleanest City for seven consecutive years (as of 2023-24) in the Swachh Survekshan rankings conducted by the Ministry of Housing and Urban Affairs.

• The city is famous for its 100% waste segregation at source into six categories: dry, wet, plastic, e-waste, domestic hazardous, and sanitary waste.

• It also hosts the Gobar-Dhan Bio-CNG plant, which is Asia's largest municipal solid waste-based Bio-CNG facility, inaugurated in February 2022.

• Green Waste and Circular Economy:

• Green waste processing helps in reducing the burden on landfills and prevents the open burning of garden waste, which is a major cause of air pollution.

• By converting organic waste into bio-energy or compost, cities contribute to the Net Zero targets and promote the Circular Economy framework.

• The PPP model in waste management ensures operational efficiency, technological innovation, and financial sustainability for

urban local bodies.

Important Points

• Swachh Survekshan: An annual survey of cleanliness, hygiene, and sanitation in cities and towns across India, launched as part of the Swachh Bharat Abhiyan.

• Capacity: The Indore green waste plant is expected to handle approximately 50 to 100 tonnes of horticultural waste daily, significantly enhancing the city's overall waste processing capacity.

• Impact: Such initiatives help in achieving Sustainable Development Goal (SDG) 11, which focuses on making cities and human settlements inclusive, safe, resilient, and sustainable.

Q98. Answer: (c) Rs. 750 crore

The correct answer is Rs. 750 crore.

Key Points

• The Union Minister of Defence, Shri Rajnath Singh, launched the ADITI (Acing Development of Innovative Technologies) scheme during the DefConnect 2024 event held in New Delhi on March 4, 2024.

• The scheme has been allocated a significant corpus of Rs. 750 crore for the period 2023-24 to 2025-26 to foster innovation in critical and strategic defence technologies.

• ADITI falls under the iDEX (Innovations for Defence Excellence) framework, which is managed by the Department of Defence Production within the Ministry of Defence.

• The primary objective of the scheme is to develop approximately 30 deep-tech critical technologies that are essential for the Indian Armed Forces, thereby reducing reliance on imports.

• Under this scheme, eligible start-ups can receive a grant-in-aid of up to Rs. 25 crore for their research and development efforts in the field of defence technology.

Additional Information

• iDEX (Innovations for Defence Excellence): Launched in April 2018, iDEX aims to create an ecosystem to foster innovation and technology development in Defence and Aerospace by engaging industries, including MSMEs, start-ups, and individual innovators.

• Defence Innovation Organisation (DIO): The iDEX scheme is funded and managed by the DIO, which is a Section 8 company formed by two major Defence Public Sector Undertakings (DPSUs): Hindustan Aeronautics Limited (HAL) and Bharat Electronics Limited (BEL).

• Aatmanirbharta in Defence: The ADITI scheme is a pivotal step toward achieving Aatmanirbhar Bharat (self-reliant India) in the defence sector, ensuring that the country's security requirements are met through indigenous technology.

• DefConnect 2024: This event served as a platform for start-ups, investors, and policymakers to collaborate; it also saw the launch of the 11th edition of the Defence India Start-up Challenge (DISC).

• Technology Domains: The scheme focuses on high-end technologies such as Artificial Intelligence (AI), Quantum Technology, Robotics, Space-based systems, and Cybersecurity for the military.

Important Points

• ADITI Challenges: In its first edition, the scheme launched 17 challenges covering various requirements of the Indian Army, Indian Navy, Indian Air Force, and the Defence Space Agency.

• Grant Structure: The grant of Rs. 25 crore is designed to support deep-tech projects that require substantial capital investment and long-term research cycles, which are often difficult for small start-ups to fund independently.

• Monitoring and Support: The Ministry of Defence provides not just financial assistance but also mentorship and trial/testing facilities to ensure the developed technologies meet the rigorous standards of the Armed Forces.

• Impact on Economy: By promoting a robust defence industrial base, the scheme aims to transform India from a major importer of defence equipment to a global exporter of advanced military hardware.

Q99. Answer: (c) Jannik Sinner

The correct answer is Jannik Sinner.

Key Points

• Jannik Sinner emerged as the champion of the Men’s Singles category at the Australian Open 2025. This victory marked his second consecutive title at the Melbourne-based Grand Slam, following his maiden win in 2024.

• In the final match held on January 26, 2025, at the Rod Laver Arena, Sinner defeated Alexander Zverev in straight sets (6–4, 6–4, 6–2). This triumph solidified his status as the World No. 1 in the ATP Rankings.

• The Italian tennis star demonstrated exceptional form throughout the tournament, reaching the final by defeating Carlos Alcaraz in a high-stakes semi-final encounter. Hence, the mention of Jannik Sinner as the winner is correct.

• By winning this title, Sinner became one of the few players in the Open Era to successfully defend his first Grand Slam title at the very next edition of the same tournament.

• The Australian Open 2025 was the 113th edition of the tournament and the first Grand Slam event of the calendar year.

Additional Information

• Jannik Sinner:

• Born in San Candido, Italy, in 2001, Sinner is known for his powerful baseline play and mental composure.

• He is the first Italian player to reach the top of the ATP Rankings and has now secured three Grand Slam titles (Australian Open 2024, US Open 2024, and Australian Open 2025).

• He is coached by the renowned Darren Cahill and Simone Vagnozzi, who have been instrumental in his rapid ascent in professional tennis.

• Alexander Zverev:

• The German professional, Alexander Zverev, was the runner-up in the 2025 edition. This was his second major Grand Slam final appearance in two years, having previously reached the final of Roland Garros in 2024.

• Zverev is an Olympic Gold Medalist (Tokyo 2020) and has won multiple ATP Masters 1000 titles.

• Australian Open Tournament:

• Established in 1905, it is the first of the four annual Grand Slam tennis tournaments, followed by the French Open, Wimbledon, and the US Open.

• The tournament moved from Kooyong to its current home at Melbourne Park in 1988, coinciding with the switch from grass courts to Hard Courts.

• The Men's Singles winner is awarded the Norman Brookes Challenge Cup, named after the former Australian tennis champion.

Important Points

• Prize Money: The total prize pool for the 2025 Australian Open saw a significant increase, with the singles winners receiving approximately AUD 3.15 million.

• Surface Technology: The matches are played on GreenSet, a brand of acrylic hard-court surface known for its medium-fast pace and consistent bounce.

• Novak Djokovic's Record: While Sinner is the current champion, Novak Djokovic holds the all-time record for the most Australian Open Men's Singles titles, with 10 trophies.

• Historical Context: Before the Open Era began in 1968, the tournament was known as the Australasian Championships and later the Australian Championships.

Q100. Answer: (d) Tuberculosis

The correct answer is Tuberculosis.

Key Points

• The Union Territory of Puducherry has integrated a specialized screening initiative for Tuberculosis (TB) within its Family Adoption Programme (FAP) to be completed by 2025.

• This initiative is part of the broader National Tuberculosis Elimination Programme (NTEP), which aims to make India TB-free by the year 2025, five years ahead of the global Sustainable Development Goal (SDG) target of 2030.

• Under the Family Adoption Programme, medical students from various government and private medical colleges, such as the Indira Gandhi Medical College and Research Institute (IGMCRI), adopt families in rural or urban-slum areas.

• The students are responsible for conducting door-to-door health surveys to identify presumptive TB cases based on symptoms like chronic cough, persistent fever, and sudden weight loss.

• This strategic screening in 2025 aims to enhance active case finding (ACF) and ensure that no TB patient remains undiagnosed within the community.

Additional Information

• Family Adoption Programme (FAP):

• Introduced by the National Medical Commission (NMC), the FAP is a mandatory part of the MBBS curriculum in India.

• It aims to provide hands-on experience to medical students in community medicine while providing healthcare access to underserved rural populations.

• The programme ensures that healthcare is delivered at the doorstep, helping in the early identification of both communicable and non-communicable diseases.

• National Strategic Plan (NSP) for TB:

• The National Strategic Plan (2017-2025) outlines the framework for TB elimination through four pillars: Detect, Treat, Prevent, and Build.

• It involves the use of molecular diagnostics like CBNAAT and Truenat for rapid testing.

• Pradhan Mantri TB Mukt Bharat Abhiyaan:

• Launched by the Ministry of Health and Family Welfare, this campaign encourages community participation through Ni-kshay Mitras who provide nutritional and vocational support to TB patients.

Important Points

• Geographic Focus: The screening is particularly intensive in the villages and coastal hamlets of Puducherry, where healthcare accessibility can sometimes be limited.

• Diagnostic Support: Once a presumptive case is identified by a student, the Health Department facilitates immediate sputum collection and X-ray examinations at the nearest Primary Health Centre (PHC).

• Ni-kshay Portal: All identified cases in Puducherry are registered on the Ni-kshay portal, a unified ICT tool used for monitoring TB patients and their treatment adherence.

• Other Options: While Diabetes, Dengue, and Malaria are significant public health challenges in Puducherry, the specific 2025 deadline-driven intensive screening under the FAP is currently prioritized for Tuberculosis to align with national elimination milestones.

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