RRB Group D Official Paper (Held On: 05 Feb, 2026 Shift 3) (Previous Year Paper)

RRB Group D • 2026 • 100 questions • 90 minutes • Answer key and solutions

Take this paper as a timed mock test

Practise under exam conditions, then review your answers after you submit.

yourmocktest.com/pyq/rrb-group-d/rrb-group-d-official-paper-held-on-05-feb-2026-shift-3-previ…

Scan the QR code or click the link to open it.

YourMockTest.com — Free Study Material

GENERAL SCIENCE

Q1. An electric heater draws 5 A of current when connected to a 70 V source. If the potential difference is increased to 126 V, what will be the new current drawn by the heater?

(a) 9 A
(b) 3 A
(c) 8 A
(d) 90 A

Q2. In a fluid, the buoyant force acting on a submerged or floating object always acts _____.

(a) vertically upward
(b) in a direction depending on the shape of the object
(c) vertically downward
(d) along the direction of motion of the object

Q3. According to the sign convention for spherical mirrors, which option is correct about the focal length of a concave mirror?

(a) Always positive
(b) Always negative
(c) Sometimes negative
(d) Sometimes positive

Q4. Which statement best defines the term 'formula unit mass' as used in the context of ionic compounds?

(a) It is the sum of the atomic masses of all atoms present in a formula unit of an ionic compound.
(b) It is the product of the atomic masses of all elements in a compound.
(c) It is the total number of atoms in a molecule of a covalent compound.
(d) It is the mass of one mole of a molecular compound.

Q5. Which of the following is NOT an example of work done?

(a) Pulling a trolley along a flat surface
(b) Lifting a brick from the floor
(c) Pushing a wall
(d) Sliding luggage on the floor

Q6. Evaporation takes place at which temperature?

(a) Only below freezing point
(b) Only at 100°C
(c) Only at boiling point
(d) At any temperature

Q7. Refer to the two statements given below and select the correct option.

Statement A: Carboxylic acids are strong acids that completely ionise in water.

Statement B: Ethanoic acid is a weak acid compared to hydrochloric acid.

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

Q8. Which of the following metals can be shaped into leaves by pressure of the fingers?

(a) Silver
(b) Gold
(c) Iron
(d) Sodium

Q9. What is the geometric relationship between the principal axis and the reflecting surface of a spherical mirror at the point of the pole P?

(a) The principal axis is parallel to the mirror surface.
(b) The principal axis intersects the mirror at an oblique angle.
(c) The principal axis is normal (perpendicular) to the mirror at its pole.
(d) The principal axis is tangent to the mirror surface.

Q10. Corrosion causes damage to the metal body, especially:

(a) in dry air
(b) in moist air
(c) by galvanisation
(d) in both dry air and oil

Q11. In mitosis, how do the chromosomes in daughter cells compare with those in the parent cell?

(a) Daughter cells lose all chromosomes during division.
(b) Daughter cells contain twice the number of chromosomes as the parent cell.
(c) Daughter cells have the same number of chromosomes as the parent cell.
(d) Daughter cells have half the number of chromosomes as the parent cell.

Q12. What is the term used for the division of cytoplasm following nuclear division?

(a) Cytokinesis
(b) Karyokinesis
(c) Chromatin condensation
(d) Interphase

Q13. In India, biodiversity hotspots are primarily located in _____.

(a) Central India and the Deccan Plateau
(b) the Western Ghats and Eastern Himalayas
(c) the Cold desert of Ladakh
(d) the Mediterranean, Sardinia and Sicily

Q14. If a fertilised egg reaches the uterus but finds the lining thin and not spongy, what could happen?

(a) The egg survives longer than usual.
(b) Menstruation is delayed but still occurs.
(c) The embryo fails to implant properly and is expelled.
(d) The egg gets fertilised again.

Q15. Which of the following is NOT an example of the third law of motion?

(a) A rocket moving upward due to gases expelled downward.
(b) Foot pushes the ground backward and ground pushes the foot forward.
(c) The swimmer pushes the water backward with her hands.

YourMockTest.com — Free Study Material

(d) Pushing a stationary car and making it move.

Q16. In daily life, the principle of force on a current-carrying conductor is used in which of the following devices?

(a) Electric fuse
(b) Electric heater
(c) Electric motor
(d) Electric bell

Q17. Which of the following sound frequencies is inaudible to humans?

(a) 5000 Hz
(b) 25,000 Hz
(c) 50 Hz
(d) 2000 Hz

Q18. What happens to the uterine lining in human females if the egg is not fertilized?

(a) It thickens further for another week.
(b) It breaks down and is discharged as blood and mucus.
(c) It remains intact for the next cycle.
(d) It is reabsorbed into the body.

Q19. In terms of chromosome contribution, which of the following is correct?

(a) Father contributes only X chromosome
(b) Mother always contributes X, father contributes X or Y
(c) Both parents contribute either X or Y
(d) Mother can contribute X or Y

Q20. Materials that have NOT been broken down by the action of bacteria or saprophytes, but somehow degraded by physical processes, are called:

(a) Decaying
(b) Biodegradable
(c) Non-biodegradable
(d) Dividable

Q21. Consider the following statements regarding the characteristics of compounds and select the correct option.

Statement 1: Elements react to form new compounds.

Statement 2: Each new substance formed is of variable composition.

Statement 3: The constituents can be separated only by chemical or electrochemical reactions.

(a) Statements 1, 2 and 3 are incorrect.
(b) Only statements 1 and 3 are correct.
(c) Statements 1, 2 and 3 are correct.
(d) Only statements 1 and 2 are correct.

Q22. ___ generally has long, unstable carbon chains.

(a) Glucose
(b) Vegetable oil
(c) Water
(d) Table salt

Q23. When two bodies interact, the action and reaction forces _____.

(a) produce the same effect on both bodies
(b) act in the same direction
(c) act on the same body
(d) act on different bodies

YourMockTest.com — Free Study Material

Q24. Which of the following is NOT made up of connective tissue?

(a) Blood
(b) Muscles
(c) Cartilage
(d) Bone

Q25. The maximum number of electrons in a shell is given by:

(a) n^2
(b) $2n$
(c) $2n^2$
(d) $(n^2)/2$

MATHEMATICS

Q26. If six cubes of 10 cm edge are joined end to end, the surface area (in cm^2) of the resulting solid will be:

(a) 2600
(b) 3900
(c) 2350
(d) 1300

Q27. A dealer purchased an oven for Rs. 651. After allowing a discount of 86% on its marked price, he still gains 68%. Find the marked price of the oven.

(a) Rs. 7,978
(b) Rs. 7,812
(c) Rs. 7,740
(d) Rs. 7,940

Q28. Successive discounts of 16% and 22% are equivalent to what single discount?

(a) 34.48%
(b) 36.95%
(c) 34.23%
(d) 31.71%

Q29. Sarah's age is 5 years more than twice her sister Emma's age. If the sum of their ages is 29 years, how old is Emma?

(a) 6 years
(b) 8 years
(c) 7 years
(d) 5 years

Q30. Find the ratio between the fourth proportional of 10, 15 and 18 to the mean proportional of 9 and 4.

(a) 9:2
(b) 12:9
(c) 10:5
(d) 7:4

Q31. If 80% of 10% of 2/3 of a number is 748, find the number.

(a) 14420
(b) 15470
(c) 17790
(d) 14025

YourMockTest.com — Free Study Material

Q32. A man buys 9 identical articles for a total of Rs. 16. If he sells each of them for Rs. 2, then his profit percentage will be _____%.

(a) 12.5
(b) 12.11
(c) 13.5
(d) 11.11

Q33. What is the mode of the following data?

75, 70, 80, 70, 80, 71, 80, 66, 87, 82, 68, 73, 80, 75, 66, 64, 66, 87, 90, 68, 89, 82, 81, 81, 65, 81, 80

(a) 80
(b) 90
(c) 75
(d) 70

Q34. Which is the greatest number that divides 47, 59 and 74 to leave the same remainder?

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

Q35. A solid metallic cylinder of radius 5 cm and height 12 cm is melted and recast into smaller solid cylinders each of radius 2 cm and height 3 cm. Find the ratio of the total surface area of one small cylinder to the total surface area of the original cylinder.

(a) 1 : 7
(b) 2 : 15
(c) 2 : 17
(d) 1 : 8

Q36. A pendulum makes an angle of swing A (in degrees), such that sinA = 1/2. Find the value of sin3A.

(a) 3/2
(b) 1/2
(c) 1
(d) 5/8

Q37. In triangle ABC, BD perpendicular to AC at D and angle DBC = 76°. E is a point on BC such that angle CAE = 53°. What is the measure of angle AEB ?

(a) 78°
(b) 67°
(c) 53°
(d) 55°

Q38. The cost of a washing machine is 25% less than the cost of a TV. If the cost of the washing machine increases by 30% and that of the TV decreases by 19%, then what is the percentage change in the total cost of 8 washing machines and 4 TVs?

(a) Decrease by 6%
(b) Increase by 11.2%
(c) Decrease by 13%
(d) Increase by 10.4%

Q39. Two pipes, A and B, can fill a tank in 30 minutes and 45 minutes, respectively, while a third pipe, C, can empty the tank in 24 minutes. Pipes A and B are opened together, and after 6 minutes, pipe C is also opened. What will be the total time required to fill the tank?

(a) 54 minutes
(b) 57 minutes
(c) 51 minutes

YourMockTest.com — Free Study Material

(d) 48 minutes

Q40. If a + b = 4 and ab = 3, find the value of $a^3 + b^3$.

(a) 32
(b) 38
(c) 36
(d) 28

Q41. The ratio of income to expenditure of a person is 8:5. What percentage of his income is his saving?

(a) 25.4%
(b) 31.3%
(c) 37.5%
(d) 20.8%

Q42. A, B, and C can do a piece of work in 3, 3, and 12 days respectively. How long (in days) will they take to do thrice the same work, working together?

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

Q43. A boy bought 4 long and 5 short notebooks for Rs. 305. If the difference in prices of the long and short notebooks is Rs. 20, then find the price (in Rs.) of each long and short notebook, respectively.

(a) 62; 42
(b) 39; 19
(c) 45, 25
(d) 44.50; 24.50

Q44. The value of the square root of the expression 32 × 64^(-2) × 2/(16^3) × 4^(m+3) is 2. Then the value of m is _____.

(a) 8
(b) 7
(c) 6
(d) 4

Q45. A bus travels 240 km in 6 hours. If it travels at the same speed, how far will it travel in 4.5 hours?

(a) 160 km
(b) 175 km
(c) 180 km
(d) 140 km

Q46. Walking at 5/6 th of his normal speed from his home, Shahid is 25 minutes late in reaching his office. The usual time taken by him to cover the distance between his home and his office is :

(a) 118 minutes
(b) 119 minutes
(c) 125 minutes
(d) 128 minutes

Q47. 6336 is divisible by 9. What should be added to or subtracted from this number so that it will be divisible by 11?

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

YourMockTest.com — Free Study Material

Q48. The amount on a sum of Rs. 7,500 at 16% per annum compound interest, compounded annually, in 2 years will be:

(a) Rs. 9,117
(b) Rs. 10,092
(c) Rs. 10,861
(d) Rs. 10,160

Q49. The mode and median of a data is 72.8 and 31, respectively. What is the mean of the data? (Use empirical formula)

(a) 7.2
(b) 10.1
(c) 15.8
(d) 5.8

Q50. Rs. 10,896 is divided among A, B and C in such a way that if Rs. 91, Rs. 4 and Rs. 57 are deducted from their respective shares, they have money in the ratio 3:8:6. Find the difference between B's and C's original shares.

(a) Rs. 1,364
(b) Rs. 1,211
(c) Rs. 1,414
(d) Rs. 1,164

GENERAL INTELLIGENCE & REASONING

Q51. If '+' means '÷', '−' means '×', '×' means '−', '÷' means '+', then what will come in place of the question mark (?) in the following equation?

608 + 76 × 6 − 37 ÷ 259 = ?

(a) 41
(b) 39
(c) 33
(d) 45

Q52. In a row of all 76 students facing the north, Mr. Hepa is 9^(th) from the left end. If Mr. Annu is 56^(th) to the right of Mr. Hepa, what is Mr. Annu's position from the right end of the row?

(a) 10th
(b) 11th
(c) 9th
(d) 12th

Q53. Refer to the following number series and answer the question that follows (all numbers are single-digit numbers only). Counting to be done from left to right only.

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

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

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

Q54. Refer to the following number series and answer the question that follows (all numbers are single-digit numbers only). Counting to be done from left to right.

(Left) 4 3 1 3 5 3 6 2 3 7 8 4 6 9 7 4 5 2 3 7 4 2 1 5 7 9 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 odd number?

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

YourMockTest.com — Free Study Material

(d) 5

Q55. What will come in place of the question mark (?) in the following equation, if '+' and '-' are interchanged and 'x' and '÷' are interchanged?

9 ÷ 2 + 24 x 6 - 3 = ? + 5

(a) 18
(b) 24
(c) 20
(d) 22

Q56. What should come in place of the question mark (?) in the given series?

0 ? 12 24 40 60

(a) 10
(b) 2
(c) 4
(d) 8

Q57. 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 its constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting /multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

15 - 3 - 5

24 - 4 - 6

(a) 20 - 2 - 10
(b) 35 - 5 - 8
(c) 63 - 7 - 11
(d) 50 - 3 - 19

Q58. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All rings are kettles.

All dogs are bottles.

No rings are bottles.

Conclusions:

(I): Some kettles are not dogs.

(II): No rings are dogs.

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

Q59. Six people, A, B, C, D, E and F, are sitting in a row, facing north. A sits third to the left of E. E sits second to the left of F. D sits to the immediate right of E. B sits to the immediate left of C. How many people sit between C and F?

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

Q60. This question is based on the five, three-digit numbers given below.

(Left) 745 768 729 716 721 (Right)

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

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

YourMockTest.com — Free Study Material

What will be the resultant if the second digit of the second highest number is added to the third digit of the lowest number?2423

(a) 10
(b) 14
(c) 13
(d) 12

Q61. 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) EF−HL
(b) VW−ZA
(c) OP−ST
(d) MN−QR

Q62. 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 easels are brushes.

Some canvases are brushes.

Conclusions:

(I): Some brushes are canvases.

(II): All easels are canvases.

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

Q63. Karthik starts from Point Y and drives 86 km towards the east. He then takes a right turn, drives 41 km, turns right and drives 61 km. He then takes a right turn and drives 92 km. He takes a left turn, drives 25 km. He then turns right, drives 31 km and stops at Point Z. How far (shortest distance) and towards which direction should he drive in order to reach Point Y again? (All turns are 90-degree turns only unless specified.)

(a) 86 km towards the north
(b) 85 km towards the west
(c) 84 km towards the south
(d) 82 km towards the south

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

7, 14, 28, 56, 112, ?

(a) 192
(b) 224
(c) 232
(d) 216

Q65. In a certain code language, ‘dirt is there’ is coded as ‘mp rc gp’ and ‘clean the dirt’ is coded as ‘hk mp bo’. How is ‘dirt’ coded in that language?

(a) mp
(b) bo
(c) hk
(d) gp

YourMockTest.com — Free Study Material

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

50 ? 40 70 30 80

(a) 75
(b) 65
(c) 55
(d) 60

Q67. In a certain code language,

A + B means ‘A is the son of B’,

A - B means ‘A is the brother of B’,

A x B means ‘A is the wife of B’,

and A & B means ‘A is the father of B’.

How is K related to V if ‘K & T - R x Z + V’?

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

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

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

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

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

Q69. Five people, A, B, C, D and E, are sitting in a row, facing north. D sits at the extreme left end of the row. E sits third to the right of A. B sits to the immediate right of A. How many people sit between D and E?

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

Q70. In a certain code language, ‘move the rocks’ is coded as ‘ld an ur’ and ‘rocks block roads’ is coded as ‘mp cq an’. How is ‘rocks’ coded in the given language?

(a) an
(b) cq
(c) mp
(d) ur

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

KIE 88 CAW 95 USO 102 MKG 109 ?

(a) EDX 116
(b) ECY 116
(c) EGJ 115
(d) EBX 115

Q72. MLPO is related to NMQP in a certain way based on the English alphabetical order. In the same way, GFJI is related to HGKJ. To which of the given options is ONRQ related, following the same logic?

(a) POSR
(b) PNRR

YourMockTest.com — Free Study Material

(c) PORR
(d) PPRV

Q73. If '+' means '−', '−' means '×', '×' means '÷' and '÷' means '+', then what will come in place of the question mark (?) in the following equation?

97 − 11 ÷ 67 + 864 × 16 = ?

(a) 1097
(b) 1055
(c) 1066
(d) 1080

Q74. IS69 is related to LO61 in a certain way. In the same way, WE43 is related to ZA35. To which of the following is GI91 related, following the same logic?

(a) KF82
(b) NF82
(c) JE83
(d) KD84

Q75. All 60 people are standing in a row facing north. Sandeep is 20th from the right end while Kiran is 10th from the left end. How many people are there between Sandeep and Kiran?

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

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

IOS 17, LRV 23, OUY 29, RXB 35, ?9640

(a) UBE 43
(b) UAE 41
(c) UZC 41
(d) SZE 42

Q77. Seven people, A, B, C, D, E, F and G, are sitting in a row, facing north.

Only three people sit to the left of C. Only D sits to the right of B. Only three people sit between B and F. A sits at some place to the left of G but at some place to the right of E.

How many people sit to the right of A?

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

Q78. Town X is to the north of Town P. Town X is to the east of Town Y. Town W is to the south of Town Y. Town Z is to the east of Town W. Town Z is to the north of Town P. What is the position of Town X with respect to Town Z?

(a) West
(b) East
(c) North
(d) South

Q79. Select the pair which follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

BDH:EGK

KMQ:NPT

(a) ITD:YDS
(b) COD:NCX

YourMockTest.com — Free Study Material

(c) BTD:FGY
(d) HQW:KTZ

Q80. 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) ZWY
(b) QOP
(c) JGI
(d) IFH

GENERAL AWARENESS AND CURRENT AFFAIRS

Q81. Who was the chief guest at India's 76th Republic Day parade in 2025?
(a) Emmanuel Macron
(b) Prabowo Subianto
(c) Vladimir Putin
(d) Joe Biden

Q82. In September 2025, the Commission for Air Quality Management (CAQM) held detailed review meetings on preparedness to prevent paddy stubble burning during the harvest season with which two state governments?
(a) Punjab and Haryana
(b) Haryana and Uttar Pradesh
(c) Punjab and Rajasthan
(d) Haryana and Uttarakhand

Q83. The Indian hockey legend PR Sreejesh was recognized with what specific prestigious honour by President Droupadi Murmu on 28 April 2025, at Rashtrapati Bhavan?
(a) Padma Bhushan
(b) Padma Vibhushan
(c) Arjuna Award
(d) Padma Shri

Q84. For which sports has Murlikant Rajaram Petkar received Arjuna Awards (Lifetime) for his outstanding performance in the year 2024?
(a) Hockey
(b) Para-Swimming
(c) Para gliding
(d) Athletics

Q85. In July 2025, two high-speed unmanned aerial targets were successfully destroyed using the Akash Prime weapon system in which Union Territory of India?
(a) Lakshadweep
(b) Ladakh
(c) Andaman and Nicobar Islands
(d) Puducherry

Q86. Which national team secured its first-ever title at the 2025 IIHF Women's Asia Cup held in Al-Ain, UAE?
(a) Philippines
(b) Iran
(c) Japan
(d) China

YourMockTest.com – Free Study Material

Q87. Under what theme was the International Day for Biological Diversity celebrated in 2025?

(a) Harmony with Nature and Sustainable Development
(b) Biodiversity and Sustainable Tourism
(c) Protect Biodiversity in Drylands
(d) Biodiversity: Food, Water and Health for All

Q88. Who among the following was sworn in as the Chief Justice of India on 24 November 2025?

(a) N. V. Ramana
(b) D. Y. Chandrachud
(c) Surya Kant
(d) Ranjan Gogoi

Q89. Which of the following three-city groups emerged as the top ‘Swachh Shehar’ in the (more than 10 lakhs population) Swachh Survekshan 2024-25 awards hosted by the Ministry of Housing and Urban Affairs?

(a) Pune, Indore, Surat
(b) Jaipur, Hyderabad, Kochi
(c) Ahmedabad, Bhopal, Lucknow
(d) Mumbai, Bengaluru, Patna

Q90. In June 2025, what was the reduced repo rate?

(a) 5.25%
(b) 5.50%
(c) 5.75%
(d) 6.00%

Q91. Which two ministries are involved in the Nurturing Aspirations through Vocational Training for Young Adolescent Girls (NAVYA) initiative?

(a) Ministry of Women and Child Development (MWCD), and Ministry of Skill Development and Entrepreneurship (MSDE)
(b) Ministry of Youth Affairs and Sports, and Ministry of Women and Child Development (MWCD)
(c) Ministry of Women and Child Development (MWCD), and Ministry of Education
(d) Ministry of Health and Family Welfare, and Ministry of Women and Child Development (MWCD)

Q92. Where did President of India Droupadi Murmu launch India’s first home-grown anti-cancer CAR-T cell therapy?

(a) Indian Institute of Technology Bombay
(b) Indian Institute of Technology Delhi
(c) Indian Institute of Technology Madras
(d) All India Institute of Medical Sciences, New Delhi

Q93. How many Padma Bhushan awards were announced in 2025?

(a) 19
(b) 25
(c) 23
(d) 21

Q94. Which institute secured Rank 1 in the inaugural SDG category of NIRF 2025?

(a) IIT Delhi
(b) IIT Kanpur
(c) IIT Madras
(d) IIT Bombay

Q95. In which city was the 15^(th) edition of the Hockey India Senior Men National Championship 2025 conducted?

(a) Ranchi
(b) Jhansi
(c) Bhopal
(d) Lucknow

YourMockTest.com — Free Study Material

Q96. Under the Environment Audit Rules, 2025, who is eligible to conduct environmental audits, and how are auditors assigned to project entities?

(a) Self-selected auditors; nomination by state government
(b) Registered Environment Auditors; random assignment method
(c) Industry-nominated auditors; allocation by industry association
(d) Project-appointed auditors; voluntary selection

Q97. Who among the following has received the National Geoscience Award for Lifetime Achievement in 2023?

(a) Prof. Suraj Mohan Banerjee
(b) Prof. Agraj Mohan Banerjee
(c) Prof. Dheeraj Mohan Banerjee
(d) Prof. Neeraj Mohan Banerjee

Q98. In May 2025, India attacked which country with a BrahMos missile?

(a) Afghanistan
(b) Iran
(c) Iraq
(d) Pakistan

Q99. Which novel by Nell Stevens exploring queerness in Victorian London was reviewed in June 2025?

(a) The Emperor of Gladness
(b) Dream Count
(c) The Original
(d) The Devil's Party

Q100. During the June 2025 Monetary Policy Committee meeting, the Reserve Bank of India cut cash reserve ratio (CRR) by how many bps?

(a) 50
(b) 100
(c) 75
(d) 150

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) 9 A

The correct answer is 9 A.

Key Points

• The relationship between voltage (V), current (I), and resistance (R) in an electrical circuit is governed by Ohm's Law, which

states that V = IR.

• In the first scenario, the electric heater is connected to a 70 V source and draws a current of 5 A. Using these values, we can calculate the resistance (R) of the heater's heating element: R = V / I = 70 / 5 = 14 Ohm.

• The resistance of the heater remains constant because it is a physical property of the material used in the heating coil (assuming the temperature change doesn't significantly alter the resistance for this calculation).

• In the second scenario, the potential difference is increased to 126 V. To find the new current, we apply Ohm's Law again using the previously calculated resistance: I = V / R.

• By substituting the new values, we get I = 126 / 14 = 9 A. Thus, the new current drawn by the heater is 9 A. Hence, the calculation confirms the correct answer is 9 A.

Additional Information

• Ohm's Law:

• Formulated by German physicist Georg Simon Ohm in 1827, it states that the current through a conductor between two points is directly proportional to the voltage across the two points, provided physical conditions like temperature remain constant.

• The SI unit of resistance is the Ohm (Ω), the unit of potential difference is the Volt (V), and the unit of current is the Ampere (A).

• Resistance Factors:

• The resistance of a conductor depends on its length, cross-sectional area, nature of the material, and temperature.

• In heating appliances like electric heaters, irons, and toasters, the coils are typically made of alloys like Nichrome because they have high resistance and do not oxidize (burn) easily at high temperatures.

• Linear Relationship:

• In an Ohmic conductor, a graph plotted between Voltage (V) and Current (I) results in a straight line passing through the origin, where the slope of the line represents the resistance.

Important Points

• Power Calculation: The power consumed by the heater also changes with voltage. Using the formula P = VI, the initial power was 70 * 5 = 350 Watts, while the new power is 126 * 9 = 1134 Watts.

• Safety Considerations: When voltage is nearly doubled (from 70 V to 126 V), the current also increases proportionally. In real-world applications, this could lead to overheating or tripping a circuit breaker if the wire's current rating is exceeded.

• Application: This principle is crucial for the design of voltage stabilizers and transformers, which ensure that appliances receive the correct potential difference to operate at their rated current.

Q2. Answer: (a) vertically upward

The correct answer is vertically upward.

Key Points

• Buoyancy is the upward force exerted by a fluid (liquid or gas) that opposes the weight of a partially or fully immersed object. In any fluid, the pressure increases with depth; therefore, the fluid exerts more pressure on the bottom of an object than on the top, resulting in a net force acting vertically upward. Hence, option 1 is correct.

• The direction of the buoyant force does not depend on the shape of the object but rather on the gravity field, which dictates that the net pressure difference will always push the object away from the center of gravity (upwards). Hence, statement 2 is incorrect.

• The weight of the object acts vertically downward due to gravity. The buoyant force is the opposing force that pushes against this weight. Hence, statement 3 is incorrect.

• The buoyant force acts independent of the direction of motion of the object. Whether an object is moving horizontally or vertically, the buoyant force remains directed vertically upward relative to the fluid's surface. Hence, statement 4 is incorrect.

• The magnitude of this force is determined by Archimedes' Principle, which states that the upward buoyant force is equal to the weight of the fluid that the object displaces.

Additional Information

• Archimedes' Principle: Discovered by the Greek mathematician Archimedes in the 3rd century BC, this principle is fundamental to fluid mechanics. It explains why heavy ships made of steel can float while a small iron nail sinks.

• Mathematical Formula: The buoyant force (Fb) can be expressed as $F_b = \rho \times V \times g$, where ρ (rho) is the density of the fluid, V is the volume of the displaced fluid, and g is the acceleration due to gravity (approximately 9.8 m/s^2).

• Factors Affecting Buoyancy:

• Density of the Fluid: A higher fluid density results in a greater buoyant force. This is why it is easier to float in saltwater (like the Dead Sea) than in freshwater.

• Volume of Displaced Fluid: The more fluid an object displaces, the larger the upward force. Large hulls of ships are designed to displace massive amounts of water to support their weight.

• Floating and Sinking:

• If the buoyant force is greater than the weight of the object, the object will rise to the surface and float.

• If the weight is greater than the buoyant force, the object will sink.

• If the weight equals the buoyant force, the object remains neutrally buoyant and stays suspended at its current depth.

Important Points

• Center of Buoyancy: This is the point where the buoyant force is considered to act. It is the geometric center (centroid) of the displaced volume of fluid. For a floating object to be stable, the relationship between the Center of Gravity and the Center of Buoyancy is critical.

• Apparent Weight: When an object is submerged in water, it feels lighter. This "loss" in weight is called the apparent weight, which is the actual weight minus the buoyant force.

• Applications: The principle of buoyancy is used in the design of submarines (using ballast tanks to change density), hot air balloons (using heated air which is less dense than cool air), and hydrometers (used to measure the specific gravity of liquids).

Q3. Answer: (b) Always negative

The correct answer is Always negative.

Key Points

• According to the New Cartesian Sign Convention, the pole (P) of the spherical mirror is taken as the origin, and the principal axis is taken as the X-axis of the coordinate system.

• A concave mirror is a converging mirror where the reflecting surface is curved inwards, towards the center of curvature.

• The principal focus (F) of a concave mirror is the point on the principal axis where rays of light parallel to the axis actually meet after reflection. This focus is situated in front of the mirror.

• Since the object is always placed on the left side of the mirror, the incident light travels from left to right. Distances measured in the direction of incident light are positive, while those measured opposite to the direction of incident light are negative.

• The focal length (f) is the distance between the pole (P) and the principal focus (F). Because the focus of a concave mirror lies to the left of the pole, this distance is measured against the direction of incident light. Hence, the focal length of a concave mirror is always negative.

Additional Information

• New Cartesian Sign Convention Rules:

• The object is always placed to the left of the mirror. This implies that the object distance (u) is always negative.

• All distances parallel to the principal axis are measured from the pole of the mirror.

• Distances measured to the right of the origin (+x-axis) are positive, and those to the left (-x-axis) are negative.

• Distances measured perpendicularly above the principal axis (+y-axis) are positive, and those below (-y-axis) are negative.

• Convex Mirror:

• A convex mirror is a diverging mirror with its reflecting surface curved outwards.

• Its principal focus is a virtual point located behind the mirror (on the right side).

• Therefore, the focal length (f) of a convex mirror is always positive.

• Mirror Formula and Magnification:

• The mirror formula represents the relationship between focal length (f), object distance (u), and image distance (v): 1/f = 1/v + 1/u.

• Magnification (m) is the ratio of the height of the image (h') to the height of the object (h), also expressed as m = -v/u.

• For a concave mirror, the radius of curvature (R) is also negative, and the relationship is R = 2f.

• Applications of Concave Mirrors:

• They are used in shaving mirrors and makeup mirrors to produce an enlarged and erect image when the object is held close.

• They are used as reflectors in car headlights, searchlights, and torches to produce a powerful parallel beam of light.

• Solar furnaces use large concave mirrors to concentrate sunlight to produce high temperatures for melting metals.

• Dentists use them to see larger images of the teeth of patients.

Important Points

• The focal length of a plane mirror is considered to be infinity because the radius of curvature of a flat surface is infinite.

• The sign of the image distance (v) in a concave mirror can be positive or negative depending on the position of the object. If the image is real (formed in front), v is negative; if the image is virtual (formed behind), v is positive.

• The focal length of a spherical mirror depends only on its radius of curvature and is independent of the medium in which it is placed (unlike lenses).

Q4. Answer: (a) It is the sum of the atomic masses of all atoms present in a formula unit of an ionic compound.

The correct answer is It is the sum of the atomic masses of all atoms present in a formula unit of an ionic compound.

Key Points

YourMockTest.com — Free Study Material

• The formula unit mass of a substance is defined as the sum of the atomic masses of all atoms in a formula unit of a compound. Hence, statement 1 is correct.

• It is calculated in the same manner as molecular mass; however, the term "formula unit" is specifically used for substances whose constituent particles are ions (ionic compounds) rather than discrete molecules.

• Statement 2 suggests it is the product of atomic masses, which is scientifically incorrect as masses are always additive in this context to determine the total mass of a unit. Hence, statement 2 is incorrect.

• Statement 3 refers to the total number of atoms in a molecule, which is actually the definition of atomicity (e.g., O2 has an atomicity of 2). Hence, statement 3 is incorrect.

• Statement 4 describes the mass of one mole of a compound, which is known as the molar mass, typically expressed in grams per mole (g/mol). Hence, statement 4 is incorrect.

• The unit used for expressing formula unit mass is the atomic mass unit, represented by the symbol ‘u’ (unified mass).

Additional Information

• Ionic Compounds vs. Molecular Compounds:

• In molecular compounds (like water, H2O), atoms are bonded covalently to form distinct molecules. We use the term molecular mass here.

• In ionic compounds (like Sodium Chloride, NaCl), the structure consists of a three-dimensional crystal lattice of alternating cations and anions. Since there are no individual "NaCl molecules," we use the formula unit (the simplest whole-number ratio of ions) to calculate mass.

• Calculation Example (Sodium Chloride):

• The formula unit of sodium chloride is NaCl.

• Atomic mass of Sodium (Na) = 23 u.

• Atomic mass of Chlorine (Cl) = 35.5 u.

• Formula unit mass = 1 × 23 + 1 × 35.5 = 58.5 u.

• Calculation Example (Calcium Chloride):

• The formula unit is CaCl2.

• Atomic mass of Calcium (Ca) = 40 u.

• Atomic mass of Chlorine (Cl) = 35.5 u.

• Formula unit mass = 40 + (2 × 35.5) = 40 + 71 = 111 u.

Important Points

• Relative Atomic Mass: All these calculations are based on the relative atomic mass of elements, which is determined relative to the Carbon-12 (12C) isotope, where 1 u is 1/12th the mass of one atom of carbon-12.

• Significance in Stoichiometry: Understanding formula unit mass is crucial for quantitative chemistry and stoichiometry, allowing scientists to calculate the exact amount of reactants and products in a chemical reaction involving ionic substances.

• Molar Mass Connection: If the formula unit mass of NaCl is 58.5 u, then its molar mass is numerically the same but expressed in grams, i.e., 58.5 g, which contains 6.022 × 10^23 (Avogadro's number) formula units.

Q5. Answer: (c) Pushing a wall

The correct answer is Pushing a wall.

Key Points

• In physics, Work is defined as the product of the Force applied to an object and the Displacement caused by that force in the direction of the force.

• The mathematical formula for work done is $W = F \times s \times \cos(\theta)$, where W is work, F is the magnitude of force, s is the displacement, and θ is the angle between the force and displacement vectors.

• For work to be considered "done" in a scientific sense, two conditions must be met: a force must act on the object, and the object must possess a non-zero displacement.

• Pulling a trolley along a flat surface: In this case, a force is applied and the trolley moves a certain distance. Since there is displacement, work is done. Hence, statement 1 is an example of work.

• Lifting a brick from the floor: A force is applied upwards to overcome gravity, and the brick moves from the floor to a height. Since displacement occurs in the direction of the force, work is done. Hence, statement 2 is an example of work.

• Pushing a wall: When a person pushes a rigid wall, they apply a significant amount of force. However, because the wall does not move, the displacement (s) is 0. According to the formula, if s = 0, then W = 0. Hence, statement 3 is NOT an example of work done.

• Sliding luggage on the floor: Force is applied to overcome friction, and the luggage moves across the floor. Since displacement occurs, work is performed. Hence, statement 4 is an example of work.

Additional Information

• Nature of Work:

• Positive Work: When the force and displacement are in the same direction (angle θ = 0°), the work done is positive.

• Negative Work: When the force and displacement are in opposite directions (angle θ = 180°), such as the force of friction acting on a moving body, the work done is negative.

• Zero Work: This occurs when displacement is zero or when the force is perpendicular to the displacement (angle θ = 90°). A classic example is a coolie carrying a load on his head while walking horizontally; the force of gravity is downward, but displacement is horizontal.

• Units and Measurements:

• The S.I. unit of work is the Joule (J). One Joule is defined as the work done when a force of 1 Newton displaces an object by 1 meter.

• In the CGS system, the unit of work is the erg. 1 Joule is equal to 10^7 ergs.

• Work is a scalar quantity, meaning it has only magnitude and no direction.

Important Points

• Work-Energy Theorem: It states that the net work done on an object is equal to the change in its Kinetic Energy. This establishes a direct link between motion and the effort exerted.

• Dimensional Formula: The dimensional representation of work is [M1 L2 T-2], which is the same as that of energy and torque.

• Power: While work represents the total energy transferred, Power is the rate at which work is done. It is measured in Watts (W), where 1 Watt = 1 Joule per second.

• Conservative Forces: Work done by gravitational or electrostatic forces depends only on the initial and final positions, not on the path taken. These are known as conservative forces.

Q6. Answer: (d) At any temperature

The correct answer is At any temperature.

Key Points

• Evaporation is a fundamental physical process where a liquid changes into its vapor state at the surface. This process occurs at any temperature below the boiling point of the liquid.

• It is classified as a surface phenomenon because it only involves the molecules located at the top layer of the liquid, unlike boiling which affects the entire volume.

• Molecules in a liquid are in constant motion and possess different levels of kinetic energy. At any temperature, a small fraction of molecules at the surface has enough energy to overcome the intermolecular forces of attraction and escape into the air as gas.

• Since the molecules with the highest energy escape, the average kinetic energy of the remaining liquid decreases, which leads to a cooling effect.

• The process of evaporation is continuous and happens even at very low temperatures, though the rate may be significantly slower compared to higher temperatures. Hence, the correct answer is At any temperature.

Additional Information

• Factors Affecting the Rate of Evaporation:

• Temperature: As the temperature increases, more molecules gain enough kinetic energy to convert into vapor, thereby increasing the rate of evaporation.

• Surface Area: Since evaporation is a surface phenomenon, increasing the exposed surface area (e.g., spreading out wet clothes) allows more molecules to escape simultaneously.

• Humidity: The rate of evaporation is inversely proportional to humidity. If the air is already saturated with water vapor, the liquid evaporates more slowly.

• Wind Speed: An increase in wind speed helps move the vapor particles away from the surface, making room for more molecules to evaporate.

• Evaporation vs. Boiling:

• Boiling occurs only at a specific temperature called the boiling point (which is 100 degrees Celsius for pure water at sea level).

• Boiling is a bulk phenomenon where bubbles form throughout the liquid, whereas evaporation is limited to the surface.

• While evaporation happens at all temperatures, boiling requires a constant supply of external heat to maintain the temperature at the boiling point.

Important Points

• Latent Heat of Vaporization: This is the amount of heat energy required to change 1 kilogram of a liquid into gas at its boiling point without a change in temperature. During evaporation, the liquid absorbs this "latent heat" from the surroundings, resulting in the characteristic cooling effect.

• Real-world Applications:

• Earthen Pots (Matkas): Water stays cool in earthen pots because water evaporates through the pores of the pot, taking heat

from the water inside.

• Sweating: The human body uses evaporation to regulate internal temperature. As sweat evaporates from the skin, it absorbs body heat, providing a cooling sensation.

• Acetone/Perfume: When you put acetone or perfume on your palm, it evaporates rapidly because of its low boiling point, making your palm feel very cold.

• Vapor Pressure: Evaporation continues until the vapor pressure above the liquid reaches a state of equilibrium with the liquid itself in a closed container. In an open system, it can continue until the liquid is completely gone.

Q7. Answer: (b) Statement A is incorrect but B is correct.

The correct answer is Statement A is incorrect but B is correct.

Key Points

• Carboxylic acids are organic compounds containing the carboxyl functional group (-COOH). Common examples include methanoic acid and ethanoic acid.

• Statement A claims that carboxylic acids are strong acids that completely ionize in water. This is scientifically inaccurate because most carboxylic acids are weak acids. In an aqueous solution, they only partially dissociate into hydrogen ions (H+) and carboxylate ions (RCOO-). Hence, statement A is incorrect.

• The degree of ionization for these acids is typically very low, often less than 1% to 5% depending on the concentration, meaning the majority of the acid remains in its molecular form in the solution.

• Statement B posits that ethanoic acid is a weak acid compared to hydrochloric acid. This is correct because hydrochloric acid (HCl) is a strong mineral acid that undergoes 100% dissociation in water, whereas ethanoic acid (CH3COOH) only partially ionizes. Hence, statement B is correct.

• The strength of an acid is determined by its acid dissociation constant (Ka). Strong acids have very high Ka values, while weak acids like those in the carboxylic family have relatively low Ka values.

Additional Information

• Ethanoic Acid (Acetic Acid):

• It has the chemical formula CH3COOH and is a colorless liquid with a distinctive sour taste and pungent smell.

• A 5% to 8% solution of ethanoic acid in water is commonly known as vinegar, which is widely used as a food preservative and in cooking.

• When pure ethanoic acid is frozen, it forms ice-like crystals; because its melting point is 290 K (16.6 degrees Celsius), it is often referred to as glacial acetic acid.

• Ionization and pH:

• The pH scale measures the concentration of hydrogen ions. For the same molar concentration, a strong acid like HCl will have a much lower pH (around 1.0) compared to a weak acid like ethanoic acid (around 3.0).

• The stability of the carboxylate ion via resonance is what allows carboxylic acids to act as acids, even though they are generally weaker than mineral acids.

Important Points

• Mineral Acids vs. Organic Acids: Mineral acids (like Sulfuric acid, Nitric acid, and Hydrochloric acid) are generally strong because they lack carbon-hydrogen bonds in the same structural context as organic acids and donate protons easily. Organic acids (like Citric acid, Tartaric acid, and Ethanoic acid) are usually weak.

• Physical Properties: Carboxylic acids have higher boiling points than alkanes, ethers, or aldehydes of comparable molecular weight because they form intermolecular hydrogen bonds, often existing as dimers even in the vapor phase.

• Solubility: Simple carboxylic acids (with 1 to 4 carbon atoms) are highly miscible in water due to their ability to form hydrogen bonds with water molecules.

Q8. Answer: (d) Sodium

The correct answer is Sodium.

Key Points

• Sodium is a member of the alkali metal group, located in Group 1 of the periodic table with the symbol Na and Atomic Number 11.

• One of the most distinctive physical properties of Sodium is its extreme softness; it has a consistency similar to soft wax or clay at room temperature.

• Unlike most common metals such as Iron or Copper, Sodium is so soft that it can be easily sliced with a stainless steel knife.

• Because of this low structural hardness and tensile strength, Sodium can be flattened or shaped into thin leaves or sheets simply by applying the pressure of the fingers.

• This property is a result of the metallic bonding in alkali metals, which involves only one valence electron, leading to a relatively weak lattice structure compared to transition metals.

Additional Information

• Reactivity and Storage:

• Sodium is highly reactive, especially with water and oxygen. To prevent it from reacting with moisture in the atmosphere, it is strictly stored under kerosene oil or liquid paraffin.

• When it reacts with water, it produces sodium hydroxide and hydrogen gas, often resulting in a vigorous or explosive reaction.

• Comparison with Other Options:

• Gold (Au): It is the most malleable and ductile metal known. While it can be beaten into incredibly thin gold leaves (foils), this process requires mechanical hammering or rolling; it cannot be shaped from a solid block into a leaf by mere finger pressure due to its higher density and atomic weight.

• Silver (Ag): Similar to gold, silver is highly malleable and used for making fine foils (like Chandi ka Varq used in sweets), but it possesses a crystalline structure that is much firmer than Sodium.

• Iron (Fe): A transition metal known for its strength and hardness. It has a high melting point of 1538°C and requires heavy machinery or high temperatures (forging) to be shaped.

• Physical Constants of Sodium:

• The melting point of Sodium is relatively low at approximately 97.8°C.

• Its density is 0.97 g/cm^3, which is less than that of water, meaning it will float while reacting.

Important Points

• Electronic Configuration: Sodium has an electronic configuration of [Ne] 3s^1. The presence of a single outer shell electron makes it highly likely to lose that electron to achieve a stable octet, forming the Na+ cation.

• Flame Test: When Sodium or its salts are introduced to a Bunsen burner flame, they impart a characteristic persistent golden-yellow color, which is a standard qualitative analysis test.

• Natural Occurrence: Due to its extreme reactivity, Sodium is never found in its elemental state in nature. It is primarily obtained through the electrolysis of molten sodium chloride (Downs process).

Q9. Answer: (c) The principal axis is normal (perpendicular) to the mirror at its pole.

The correct answer is The principal axis is normal (perpendicular) to the mirror at its pole.

Key Points

• The Principal Axis of a spherical mirror is an imaginary straight line that passes through the Center of Curvature (C) and the Pole (P) of the mirror.

• A spherical mirror (whether Concave or Convex) is a segment of a Hollow Sphere. According to the laws of geometry, any line drawn from the center of a sphere to its surface is a Radius.

• A Radius is always Normal (Perpendicular) to the surface of the sphere at the point where it intersects. Since the Principal Axis passes through the Center of Curvature, it acts as a normal to the mirror's surface at the Pole (P). Hence, the statement regarding its perpendicularity is correct.

• This geometric relationship ensures that a ray of light traveling along the Principal Axis strikes the mirror at an Angle of Incidence of 0 degrees relative to the normal, causing it to reflect back along the same path.

• At the Pole, the Principal Axis is at an angle of 90 degrees to the Tangent drawn at the pole on the mirror's reflecting surface.

Additional Information

• Components of a Spherical Mirror:

• Pole (P): This is the Geometric Center of the reflecting surface of a spherical mirror. It is located exactly on the surface of the mirror.

• Center of Curvature (C): It is the center of the Hollow Glass Sphere of which the mirror is a part. For a Concave Mirror, it lies in front of the reflecting surface, whereas for a Convex Mirror, it lies behind it.

• Radius of Curvature (R): This is the linear distance between the Pole and the Center of Curvature (PC). It represents the radius of the sphere from which the mirror was cut.

• Principal Focus (F): It is a point on the Principal Axis where light rays that are parallel to the axis converge (in Concave Mirrors) or appear to diverge from (in Convex Mirrors) after reflection.

• Focal Length (f): The distance between the Pole and the Principal Focus is known as the Focal Length. For mirrors with a small Aperture, the relationship is R = 2f.

• Types of Spherical Mirrors:

• Concave Mirror: Also known as a Converging Mirror, its reflecting surface is curved inwards. It is used in Headlights, Solar Furnaces, and by Dentists to see enlarged images.

• Convex Mirror: Also known as a Diverging Mirror, its reflecting surface is curved outwards. It always forms a Virtual, Erect, and Diminished image and is primarily used as Rear-view Mirrors in vehicles because of its wide field of view.

Important Points

• Sign Convention (New Cartesian Sign Convention):

• The Pole (P) is taken as the Origin.

• Objects are always placed to the Left of the mirror.

• Distances measured in the direction of Incident Light (to the right) are taken as Positive, while those measured against it (to the left) are Negative.

• The Focal Length of a Concave Mirror is always Negative, and for a Convex Mirror, it is always Positive.

• Aperture: The diameter of the reflecting surface of a spherical mirror is called its Aperture. In most educational problems, we assume the Aperture is much smaller than the Radius of Curvature.

Q10. Answer: (b) in moist air

p-The correct answer is in moist air.

Key Points

• Corrosion is a natural process that converts a refined metal into a more chemically stable form such as oxide, hydroxide, or sulfide. It is an electrochemical process that gradually destroys materials through chemical reactions with their environment.

• The presence of moist air, which contains both oxygen and water vapor, is the essential condition for the rusting of iron and the corrosion of many other metals. Water acts as an electrolyte, allowing the flow of ions between the anodic and cathodic regions on the metal surface. Hence, the statement "in moist air" is correct.

• In dry air, the lack of moisture prevents the formation of an electrolytic medium. Without water, the movement of ions is restricted, and the oxidation of the metal happens extremely slowly or not at all at room temperature. Hence, the statement "in dry air" is incorrect.

• Galvanisation is actually a protective measure against corrosion. It involves coating iron or steel with a thin layer of zinc to prevent oxygen and moisture from reaching the underlying metal. Hence, the statement "by galvanisation" is incorrect as it prevents rather than causes damage.

• The presence of oil acts as a barrier that seals the metal surface from the atmosphere. By excluding both oxygen and moisture, oil prevents the chemical reaction required for corrosion to occur. Hence, the statement "in both dry air and oil" is incorrect.

Additional Information

• Rusting of Iron: This is the most common form of corrosion. The chemical formula for rust is $Fe_2O_3 \cdot xH_2O$ (hydrated iron(III) oxide). It occurs when iron reacts with oxygen in the presence of water. Unlike some other metal oxides, rust is porous and flakes off, exposing fresh metal to further corrosion.

• Corrosion of Copper: When exposed to moist air, copper develops a green coating. This green substance is a mixture of copper hydroxide and copper carbonate, often referred to as patina.

• Tarnishing of Silver: Silver objects turn black when exposed to air containing hydrogen sulfide gas. The black coating is silver sulfide (Ag_2S), which is a result of a chemical reaction with sulfur compounds in the atmosphere.

• Factors Accelerating Corrosion: The rate of corrosion increases in the presence of impurities in the metal, high temperature, and electrolytes like saltwater. This is why ships and structures in coastal areas corrode much faster than those in inland regions.

Important Points

• Prevention Methods: To save metals from damage, several techniques are used, including painting, oiling, greasing, electroplating, and alloying.

• Alloying: Creating an alloy such as stainless steel (a mixture of iron, carbon, chromium, and nickel) makes the metal highly resistant to corrosion because the chromium forms a thin, invisible layer of chromium oxide on the surface.

• Economic Impact: Every year, corrosion causes significant damage to car bodies, bridges, iron railings, and ships, leading to massive financial losses in the global industrial sector.

• Sacrificial Protection: In this method, a more reactive metal (like magnesium or zinc) is attached to the metal to be protected. The more reactive metal corrodes first, "sacrificing" itself to protect the primary structure.

Q11. Answer: (c) Daughter cells have the same number of chromosomes as the parent cell.

The correct answer is Daughter cells have the same number of chromosomes as the parent cell.

Key Points

• Mitosis is a fundamental process of cell division where a single parent cell divides to produce two genetically identical daughter cells.

• The primary function of mitosis is the growth of the organism and the repair or replacement of damaged tissues.

• During the S phase of Interphase (the phase preceding mitosis), the cell replicates its DNA. This ensures that there is a duplicate copy of every chromosome available for the division process.

• Because the genetic material is duplicated and then partitioned equally, the daughter cells maintain the exact same chromosomal number as the original parent cell.

• In biological terms, if the parent cell is diploid (2n), the resulting daughter cells will also be diploid (2n). Hence, the statement that

daughter cells have the same number of chromosomes is correct.

Additional Information

• The Stages of Mitosis: Mitosis is a continuous process but is generally divided into four main stages:

• Prophase: The chromatin condenses into visible chromosomes, and the nuclear envelope begins to disappear.

• Metaphase: The chromosomes align along the equatorial plane (metaphase plate) of the cell, ensuring proper separation.

• Anaphase: The sister chromatids are pulled apart by spindle fibers toward opposite poles of the cell.

• Telophase: New nuclear membranes form around the two sets of separated chromosomes, which begin to de-condense back into chromatin.

• Equational Division: Mitosis is often referred to as equational division because the number of chromosomes remains constant from the parent to the daughter cells.

• Comparison with Meiosis: Unlike mitosis, meiosis is a "reduction division" occurring in germ cells to produce gametes (sperm and eggs). In meiosis, the daughter cells end up with half (haploid, n) the number of chromosomes compared to the parent cell.

• Cytokinesis: This is the final step of the cell cycle where the cytoplasm of the parent cell physically divides into two, resulting in two distinct daughter cells.

Important Points

• Chromosome Count in Humans: In a typical human somatic cell, there are 46 chromosomes (23 pairs). After undergoing mitosis, each of the two daughter cells will also contain 46 chromosomes.

• Genetic Stability: Mitosis is crucial for maintaining genomic integrity. By producing clones of the parent cell, it ensures that every cell in a multicellular organism (except gametes) carries the same genetic information.

• Occurrence: In humans and many animals, mitosis occurs almost everywhere in the body, such as the skin, bone marrow, and lining of the gut, where constant cell turnover is required.

• Discovery: The process of mitosis was first observed and described by the German biologist Walther Flemming in the year 1882.

Q12. Answer: (a) Cytokinesis

The correct answer is Cytokinesis.

Key Points

• Cytokinesis is the physical process of cell division, which divides the cytoplasm of a parental cell into two daughter cells.

• It typically begins during the late stages of nuclear division (Anaphase or Telophase) and ensures that each daughter cell receives a nucleus and a share of cytoplasmic organelles.

• In animal cells, the process occurs through the formation of a cleavage furrow. A contractile ring composed of actin and myosin filaments constricts the cell membrane inward until the cell is pinched into two.

• In plant cells, due to the presence of a rigid cell wall, a cleavage furrow cannot form. Instead, a cell plate is synthesized in the center of the cell by the fusion of Golgi-derived vesicles, which then grows outward to join the existing lateral walls.

• This stage marks the completion of the M phase (Mitotic phase) of the cell cycle, resulting in two distinct cells that can then enter the G1 phase of Interphase.

Additional Information

• Karyokinesis:

• This refers to the division of the cell nucleus during mitosis or meiosis. It is divided into four main stages: Prophase, Metaphase, Anaphase, and Telophase.

• While cytokinesis deals with the cytoplasm, karyokinesis ensures the equal distribution of replicated DNA (chromosomes) into the daughter nuclei.

• Interphase:

• Known as the preparatory phase, it accounts for approximately 95% of the duration of the cell cycle.

• It is divided into three sub-phases: G1 (cell growth), S (DNA replication), and G2 (further growth and protein synthesis). During the S phase, the amount of DNA per cell doubles, but the chromosome number remains the same.

• Chromatin Condensation:

• This process occurs primarily during Prophase. The diffuse network of DNA and proteins (chromatin) undergoes coiling and folding to form compact, visible chromosomes.

• Condensation is crucial for the safe transport of genetic material to the opposite poles of the cell without entanglement or breakage.

• Syncytium:

• In some organisms, karyokinesis is not followed by cytokinesis, leading to a multinucleate condition.

• A classic biological example is the liquid endosperm in coconut, where many nuclei exist within a common cytoplasm before cellularization occurs.

Important Points

• The term mitosis is often used interchangeably with the M phase, but technically, mitosis refers to karyokinesis (nuclear division), while the total cell splitting is only complete after cytokinesis.

• The centrosomes and spindle fibers play a vital role in karyokinesis by pulling sister chromatids apart during Anaphase.

• Errors in cytokinesis or karyokinesis can lead to aneuploidy (abnormal number of chromosomes) or polyploidy, which are often linked to cancer development or specific evolutionary traits in plants.

• The regulatory proteins called cyclins and cyclin-dependent kinases (CDKs) control the transition between these various stages of the cell cycle to ensure genomic stability.

Q13. Answer: (b) the Western Ghats and Eastern Himalayas

The correct answer is the Western Ghats and Eastern Himalayas.

Key Points

• The term Biodiversity Hotspot refers to a biogeographic region with significant levels of biodiversity that is under threat from human habitation. The concept was first introduced by British ecologist Norman Myers in 1988.

• In India, there are four major biodiversity hotspots: the Himalayas, the Western Ghats, the Indo-Burma region, and Sundaland (which includes the Nicobar Islands).

• The Western Ghats run parallel to the western coast of the Indian peninsula, spanning states like Kerala, Karnataka, Tamil Nadu, Maharashtra, and Goa. It is one of the eight "hottest hotspots" of biological diversity in the world. Hence, the inclusion of Western Ghats in the option is correct.

• The Eastern Himalayas region includes parts of North-East India, Bhutan, and Nepal. It is home to a vast variety of flora and fauna, including many endemic species like the Red Panda and the Snow Leopard. Hence, the inclusion of Eastern Himalayas in the option is correct.

• Option 1 mentions Central India and the Deccan Plateau; while these regions are ecologically significant, they do not meet the strict international criteria to be classified as global biodiversity hotspots. Hence, statement 1 is incorrect.

• Option 3 mentions the Cold desert of Ladakh; while it is a unique ecosystem with specific biodiversity, it is not categorized as a primary biodiversity hotspot under the global classification. Hence, statement 3 is incorrect.

• Option 4 refers to the Mediterranean, Sardinia, and Sicily; these locations are part of the Mediterranean Basin hotspot, which is entirely outside the geographical boundaries of India. Hence, statement 4 is incorrect.

Additional Information

• Criteria for Biodiversity Hotspots: To qualify as a hotspot, a region must meet two strict criteria:

• It must contain at least 1,500 species of vascular plants (more than 0.5% of the world's total) as endemics.

• It has to have lost at least 70% of its original native habitat.

• Global Context: Currently, there are 36 biodiversity hotspots identified worldwide. These areas represent just 2.4% of Earth's land surface but support more than half of the world's plant species as endemics.

• Indo-Burma Region: This hotspot encompasses a vast area including the North-Eastern states of India (specifically south of the Brahmaputra River), Myanmar, Thailand, and Vietnam. It is known for its high degree of endemism in freshwater turtle species.

• Sundaland: This region covers the Nicobar group of Islands in India, along with Indonesia, Malaysia, and Singapore. It is characterized by its tropical rainforests and iconic species like the Orangutan (though not found in the Indian portion).

Important Points

• The Western Ghats was declared a UNESCO World Heritage Site in 2012 due to its immense influence on the Indian monsoon weather pattern.

• India is recognized as one of the 17 mega-diverse countries in the world, harboring about 7-8% of all recorded species despite having only 2.4% of the global land area.

• The Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal agency in India responsible for the conservation of these hotspots through various National Parks, Wildlife Sanctuaries, and Biosphere Reserves.

• Major threats to these hotspots include habitat fragmentation, invasive species, over-exploitation, and climate change. For instance, the Shola grasslands in the Western Ghats are highly sensitive to temperature fluctuations.

Q14. Answer: (c) The embryo fails to implant properly and is expelled.

The correct answer is The embryo fails to implant properly and is expelled.

Key Points

• The Uterus (womb) is a major female hormone-responsive secondary sex organ. Each month, the inner lining of the uterus, known as the Endometrium, prepares itself to receive a Fertilised Egg.

• For a successful pregnancy, the Endometrium must become Thick and Spongy, enriched with Blood Vessels and nutrients to support the Embryo.

• Implantation is the process where the Blastocyst (the early-stage embryo) attaches to the uterine wall. If the lining is Thin and not spongy, the embryo cannot find a secure place to anchor or receive nourishment. Hence, the statement that the embryo fails to

implant properly and is expelled is correct.

• If the Fertilised Egg (embryo) fails to implant, the body does not receive the hormonal signal (HCG) to maintain the thickened lining. Consequently, the lining breaks down, and the embryo is shed along with the blood and tissues during Menstruation.

• The idea that the egg survives longer than usual is biologically incorrect, as a non-implanted embryo has a very limited window of viability without maternal support. Hence, statement 1 is incorrect.

• The claim that the egg gets fertilised again is impossible because Fertilisation occurs in the Fallopian Tube, and once an egg is fertilised, the Zona Pellucida hardens to prevent Polyspermy. Hence, statement 4 is incorrect.

Additional Information

• Role of Progesterone: This hormone is primarily responsible for making the Endometrium "spongy" and Secretory. It is produced by the Corpus Luteum after Ovulation. If Progesterone levels are low, the lining remains thin, leading to Infertility.

• The Menstrual Cycle: It consists of several phases. During the Proliferative Phase, Estrogen causes the lining to thicken. During the Secretory Phase, the lining becomes prepared for Implantation. If no implantation occurs, the Menstrual Phase begins.

• Fertilisation vs. Implantation: Fertilisation is the union of Sperm and Ovum, typically occurring in the Ampulla of the Fallopian Tube. Implantation occurs about 6 to 10 days later in the Uterus.

• Endometrial Thickness: In clinical medicine, a thickness of at least 7 mm to 8 mm is usually considered necessary for a high chance of successful Embryo Implantation during IVF or natural cycles.

Important Points

• Human Chorionic Gonadotropin (HCG): This is the "pregnancy hormone." It is produced by the cells surrounding a growing embryo, which eventually form the Placenta. Its primary role is to keep the Corpus Luteum producing Progesterone, preventing the Menstrual Cycle from starting.

• Luteal Phase Deficiency: This is a condition where the Uterine Lining does not develop sufficiently because of inadequate Progesterone levels or the lining's failure to respond to the hormone, often leading to Early Miscarriage.

• Expulsion Process: When implantation fails, the embryo, which is microscopic at this stage, is expelled naturally. This often goes unnoticed as it occurs around the same time as a regular Menstrual Period.

Q15. Answer: (d) Pushing a stationary car and making it move.

The correct answer is Pushing a stationary car and making it move.

Key Points

• Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction. This means that forces always exist in pairs, and the two forces act on different bodies simultaneously.

• A rocket moving upward due to gases expelled downward: This is a classic example of the third law. The rocket engine expels hot exhaust gases downward (action), and these gases exert an equal force on the rocket upward (reaction). Hence, this is an example of the third law.

• Foot pushes the ground backward and ground pushes the foot forward: When we walk, our feet exert a backward force on the ground (action). According to the law, the ground exerts an equal and forward force on our feet (reaction), allowing us to move. Hence, this is an example of the third law.

• The swimmer pushes the water backward with her hands: A swimmer exerts a force on the water in the backward direction (action). In response, the water exerts an equal force on the swimmer in the forward direction (reaction), pushing her through the water. Hence, this is an example of the third law.

• Pushing a stationary car and making it move: While there is a reaction force on the person's hands, the act of changing the state of a stationary object involves overcoming inertia and applying an unbalanced force to create acceleration. This is primarily described by Newton's Second Law (F = ma) and the First Law (Law of Inertia). Hence, this is NOT a primary example of the third law in this context.

Additional Information

• Newton's First Law of Motion (Law of Inertia): It states that an object will remain at rest or move in a straight line at a constant velocity unless acted upon by an external unbalanced force. The tendency of an object to resist changes in its state of motion is called Inertia, which depends on the mass of the object.

• Newton's Second Law of Motion: This law defines force quantitatively. It states that the rate of change of momentum of an object is directly proportional to the applied force and takes place in the direction of the force. The mathematical formula is Force (F) = mass (m) × acceleration (a).

• Sir Isaac Newton: He was an English mathematician and physicist who formulated the three laws of motion in his work "Philosophiae Naturalis Principia Mathematica", published in 1687. These laws form the foundation of classical mechanics.

• Conservation of Momentum: Newton's Third Law leads to the principle of conservation of linear momentum. In an isolated system where no external forces act, the total momentum remains constant over time, regardless of internal changes or collisions.

Important Points

• Force Pairs: It is important to note that the action and reaction forces never act on the same body. If they did, the net force on every object would always be zero, and motion would be impossible.

• Simultaneity: There is no time lag between action and reaction; they occur at the exact same instant.

• Magnitude and Direction: The two forces in a third-law pair always have the same magnitude but act in exactly opposite directions.

• Applications in Technology: The third law is essential for the design of jet engines, propellers, recoil mechanisms in guns, and even the simple act of rowing a boat.

Q16. Answer: (c) Electric motor

The correct answer is Electric motor.

Key Points

• The Electric motor is a rotating device that converts electrical energy into mechanical energy. It is based on the principle that a current-carrying conductor placed in a magnetic field experiences a mechanical force.

• When a rectangular coil carrying current is placed in a magnetic field, the magnetic force acts on the arms of the coil, causing it to rotate continuously. Hence, the correct answer is Electric motor.

• Electric fuse: It is a safety device used in electrical circuits that works on the heating effect of electric current (Joule heating). It consists of a wire with a low melting point that melts and breaks the circuit if the current exceeds a safe limit. Hence, statement 1 is incorrect.

• Electric heater: This device converts electrical energy into heat energy using a high-resistance heating element, typically made of Nichrome. It operates purely on the thermal effect of current rather than mechanical force. Hence, statement 2 is incorrect.

• Electric bell: While it uses electromagnetism, its operation relies on the magnetic effect of electric current to attract an armature (striker) periodically. It does not use the continuous force on a conductor in the same way a motor does to produce rotation. Hence, statement 4 is incorrect.

Additional Information

• Fleming's Left-Hand Rule: This rule is used to find the direction of the force acting on a current-carrying conductor in a magnetic field. If the forefinger represents the magnetic field and the middle finger represents the current, then the thumb points in the direction of the motion or force.

• Lorentz Force: The fundamental physics behind this is the Lorentz force law, which states that a point charge moving in a magnetic field experiences a force. For a wire of length L carrying current I in a magnetic field B, the force F is calculated as F = BIL sin(theta).

• Applications of Electric Motors: These are used in a wide variety of daily appliances including water pumps, electric fans, washing machines, mixers, refrigerators, and electric cars.

• Commutator: In a DC motor, a device called a split-ring commutator is used to reverse the direction of current every half rotation, ensuring the torque remains in the same direction and the motor continues to spin.

Important Points

• Armature: The soft iron core on which the coil is wound is called an armature. This enhances the power of the motor by increasing the magnetic flux.

• Magnetic Field Sources: Commercial motors use an electromagnet instead of a permanent magnet to create a much stronger magnetic field, allowing the motor to perform heavy-duty work.

• Energy Transformation: While a motor converts electrical to mechanical energy, an electric generator works on the reverse principle (Electromagnetic Induction) to convert mechanical to electrical energy.

• Efficiency: Modern electric motors can be highly efficient, often converting over 90 percent of electrical energy into useful mechanical work, far surpassing internal combustion engines.

Q17. Answer: (b) 25,000 Hz

The correct answer is 25,000 Hz.

Key Points

• The human ear is sensitive to sound waves within a specific frequency range, typically defined as 20 Hz to 20,000 Hz (or 20 kHz).

• Any sound frequency that falls outside this range is generally considered inaudible to the average human being.

• 25,000 Hz is greater than the upper limit of 20,000 Hz, making it inaudible to humans. Hence, option 2 is correct.

• 5000 Hz falls comfortably within the audible range. Hence, option 1 is audible and incorrect.

• 50 Hz is at the lower end of the audible spectrum but is still perceivable by the human ear. Hence, option 3 is audible and incorrect.

• 2000 Hz is within the range where human hearing is most sensitive, particularly for speech. Hence, option 4 is audible and incorrect.

• The unit of frequency is the Hertz (Hz), named after the German physicist Heinrich Rudolf Hertz, which represents one cycle per second.

YourMockTest.com – Free Study Material

Additional Information

• Classification of Sound based on Frequency:

• Infrasonic Sound: These are sounds with frequencies lower than 20 Hz. They are produced by large sources like earthquakes, volcanic eruptions, and ocean waves. Animals like elephants and whales can communicate using infrasound over long distances.

• Audible Sound: The standard range for humans is 20 Hz to 20,000 Hz. Sensitivity varies with age and exposure to loud noises; children can often hear slightly higher frequencies than adults.

• Ultrasonic Sound (Ultrasound): These are sounds with frequencies higher than 20,000 Hz. While humans cannot hear them, animals such as bats, dogs, and dolphins can perceive and utilize these frequencies.

• Applications of Ultrasound:

• Medical Imaging: Used in ultrasonography (sonogram) to visualize internal organs and monitor fetal development during pregnancy.

• SONAR (Sound Navigation and Ranging): Used by ships and submarines to detect underwater objects or measure the depth of the sea.

• Industrial Cleaning: High-frequency waves are used to clean parts located in hard-to-reach places, such as spiral tubes and electronic components.

• Physics of Sound:

• Sound is a mechanical longitudinal wave that requires a medium (solid, liquid, or gas) to travel. It cannot travel through a vacuum.

• The pitch of a sound is directly related to its frequency; higher frequency results in a higher pitch (shrill sound), while lower frequency results in a lower pitch (bass sound).

Important Points

• Hearing Loss and Age: As humans age, a condition known as presbycusis often occurs, where the ability to hear high-frequency sounds (near 15,000 Hz - 20,000 Hz) diminishes first.

• Dogs and Whistles: Special whistles known as Galton's whistles produce sounds in the ultrasonic range (above 20,000 Hz). Dogs can hear these signals, but they remain silent to human observers.

• Speed of Sound: The speed of sound is approximately 343 meters per second in dry air at 20°C. It travels fastest in solids and slowest in gases.

• Intensity vs. Frequency: It is important to distinguish between frequency (pitch, measured in Hz) and intensity/loudness (measured in Decibels or dB). A frequency of 25,000 Hz is inaudible regardless of how "loud" (intense) it is played.

Q18. Answer: (b) It breaks down and is discharged as blood and mucus.

The correct answer is It breaks down and is discharged as blood and mucus.

Key Points

• The uterus (womb) prepares itself every month to receive a fertilized egg. To provide a nourishing environment for a potential embryo, the inner lining of the uterus, known as the endometrium, becomes thick and spongy, rich with blood vessels.

• If fertilization by a sperm does not occur, the ovum (egg) survives for about one day. Since the egg is not fertilized, the thick lining of the uterus is no longer required for implantation or pregnancy.

• As the levels of hormones like progesterone and estrogen drop, the uterine lining begins to break down slowly.

• This broken-down lining, along with the unfertilized egg and blood, is discharged from the body through the vagina. This process is called menstruation. Hence, the correct answer is option 2.

• The flow of blood and mucus usually lasts for about 2 to 8 days, and the entire menstrual cycle typically repeats approximately every 28 days.

Additional Information

• Phases of the Menstrual Cycle:

• Menstrual Phase: This is the bleeding phase where the endometrium is shed. It marks the start of a new cycle (Day 1).

• Follicular Phase: Under the influence of Follicle Stimulating Hormone (FSH), new follicles develop in the ovary, and the estrogen levels rise to rebuild the uterine lining.

• Ovulation: Around Day 14 of a 28-day cycle, a mature egg is released from the ovary into the fallopian tube.

• Luteal Phase: After ovulation, the ruptured follicle turns into the corpus luteum, which secretes progesterone to maintain the thickness of the endometrium.

• Key Biological Terms:

• Menarche: The very first menstruation that occurs at puberty, usually between the ages of 10 and 15 years.

• Menopause: The permanent cessation of the menstrual cycle, which typically occurs in females between the ages of 45 and 55 years.

• Hormonal Regulation: The cycle is controlled by the pituitary gland (FSH and LH) and the ovaries (Estrogen and Progesterone).

Important Points

• Effect of Fertilization: If the egg is fertilized, the corpus luteum does not degenerate. It continues to produce progesterone, which keeps the uterine lining intact to support the developing fetus, and menstruation does not occur during pregnancy.

• Endometrium Function: Its primary role is to provide nutrition and oxygen to the embryo via the placenta once implantation occurs.

• Variation: While 28 days is the average, the cycle length can vary between 21 and 35 days depending on health, stress, and dietary factors.

• Excretion: The discharge consists of blood, tissue debris from the uterine wall, and unfertilized oocytes.

Q19. Answer: (b) Mother always contributes X, father contributes X or Y

The correct answer is Mother always contributes X, father contributes X or Y.

Key Points

• In humans, the sex of a child is determined by the types of chromosomes inherited from the parents. Human cells contain 23 pairs of chromosomes, out of which 22 pairs are autosomes and one pair is the sex chromosome.

• Females have a homogametic sex chromosome makeup, meaning they possess two identical X chromosomes (XX). During the process of meiosis and gamete formation, every egg produced by a female will carry an X chromosome. Hence, the statement that the mother always contributes an X chromosome is correct.

• Males have a heterogametic sex chromosome makeup, consisting of one X chromosome and one Y chromosome (XY). Consequently, 50% of the sperms produced by a male carry the X chromosome, while the other 50% carry the Y chromosome. Hence, the statement that the father contributes X or Y is correct.

• If a sperm carrying an X chromosome fertilizes an egg (which always has an X), the resulting zygote will be XX, leading to a female child. Hence, statement 1 is incorrect as the father can also contribute a Y chromosome.

• If a sperm carrying a Y chromosome fertilizes an egg, the resulting zygote will be XY, leading to a male child. Hence, statement 4 is incorrect because the mother cannot contribute a Y chromosome.

• The genetic probability for the birth of a boy or a girl is 50:50, and it depends entirely on the chromosome contributed by the father's sperm. Hence, statement 3 is incorrect because the mother cannot contribute "either" X or Y.

Additional Information

• Sex Determination Systems:

• While humans use the XY system, other organisms have different mechanisms. In birds, the sex determination follows a ZW system where the female is heterogametic (ZW) and the male is homogametic (ZZ).

• In certain insects like grasshoppers, an XO system is present, where females have XX and males have only one X chromosome (XO).

• The Y Chromosome and SRY Gene:

• The Y chromosome is significantly smaller than the X chromosome. It contains the SRY gene (Sex-determining Region Y), which is responsible for triggering the development of male characteristics in an embryo.

• In the absence of a functional SRY gene, the embryo will typically develop female reproductive structures.

• Chromosomal Abnormalities:

• Errors during cell division can lead to conditions like Turner Syndrome (45, XO), where an individual has only one X chromosome, or Klinefelter Syndrome (47, XXY), where a male has an extra X chromosome.

Important Points

• History: The X chromosome was first identified by Hermann Henking in 1891 during his study of insects, though he initially called it the "X-body."

• Inheritance: Since a male (XY) always receives his Y chromosome from his father, the Y chromosome can be used to trace patrilineal ancestry. Similarly, because mitochondrial DNA is inherited only from the mother, it is used for matrilineal tracing.

• Function of X Chromosome: Unlike the Y chromosome, the X chromosome contains over 900 genes, many of which are essential for biological functions unrelated to sex, such as blood clotting and color vision.

Q20. Answer: (c) Non-biodegradable

The correct answer is Non-biodegradable.

Key Points

• Non-biodegradable materials are substances that cannot be decomposed, dissolved, or broken down by natural biological agents such as bacteria, fungi, or saprophytes.

• While these materials resist biological decay, they are subject to physical processes such as photodegradation (breakdown by UV radiation from the sun), thermal degradation, and mechanical weathering caused by wind or water.

• These substances are typically synthetic or man-made, featuring strong chemical bonds that natural enzymes cannot penetrate or metabolize.

• Because they are not part of the natural nutrient cycle, they persist in the environment for extremely long periods, ranging from decades to thousands of years.

• Common examples of such materials include plastics, polythene bags, glass, metal scraps, synthetic fibers like nylon, and certain pesticides like DDT.

Additional Information

• Biodegradable Materials:

• These are organic substances that can be easily broken down into simpler compounds like carbon dioxide, water, and methane by the action of microorganisms.

• Examples include food waste, paper, wood, leaves, and animal waste. These materials are eco-friendly as they return nutrients to the soil.

• Saprophytes:

• These are organisms, including certain bacteria and fungi, that obtain their nutrition from dead and decaying organic matter.

• They play a critical role as decomposers in the ecosystem, but they lack the capacity to process non-biodegradable waste due to the absence of specific catalytic enzymes.

• Physical Degradation:

• This refers to the fragmentation of materials into smaller pieces without changing their chemical nature significantly.

• In the case of plastics, physical processes lead to the formation of microplastics (particles smaller than 5mm), which pose a severe threat to marine life and enter the human food chain.

Important Points

• Biomagnification: Non-biodegradable pollutants like mercury and DDT do not decompose and instead accumulate in the bodies of organisms. Their concentration increases at each successive trophic level of the food chain.

• Environmental Persistence: A simple plastic bottle can take up to 450 years to fragment through physical processes, while glass may take over 1 million years to break down, highlighting the permanence of non-biodegradable waste.

• Waste Management: Since biological methods fail, the management of these materials relies on the 3Rs: Reduce, Reuse, and Recycle. Specialized industrial processes like pyrolysis or incineration are sometimes used to manage synthetic polymers.

• Impact on Soil: The accumulation of non-biodegradable waste reduces soil porosity and interferes with the nitrogen-fixing capability of soil bacteria, eventually leading to land degradation.

Q21. Answer: (b) Only statements 1 and 3 are correct.

The correct answer is Only statements 1 and 3 are correct.

Key Points

• Statement 1: When two or more elements undergo a chemical reaction, they combine to form a new substance known as a compound. This process involves the breaking of old bonds and the formation of new chemical bonds, resulting in a product that has entirely different physical and chemical properties from its constituents. Hence, statement 1 is correct.

• Statement 2: A compound is characterized by a fixed composition of its constituent elements by mass. Unlike mixtures, which can have variable composition (meaning the components can be present in any ratio), the elements in a compound are always present in definite proportions. For instance, pure water will always contain Hydrogen and Oxygen in a mass ratio of 1:8. Hence, statement 2 is incorrect.

• Statement 3: The constituents of a compound are chemically unified and cannot be separated by simple physical methods such as filtration, evaporation, distillation, or magnetic separation. Separation of these elements requires the application of energy through chemical reactions or electrochemical reactions, such as the process of electrolysis to separate water into hydrogen and oxygen. Hence, statement 3 is correct.

• Consequently, out of the three given statements, only the first and the third accurately describe the characteristics of a chemical compound.

Additional Information

• Definition of a Compound: A compound is a pure substance made up of two or more elements chemically combined in a fixed ratio. Examples include Sodium Chloride (NaCl), Methane (CH4), and Carbon Dioxide (CO2). A compound is always homogeneous in nature, meaning its properties are uniform throughout the sample.

• Properties of Compounds: The properties of a compound are distinctly different from the properties of the elements that form it. For example, Sodium (Na) is a highly reactive metal and Chlorine (Cl) is a poisonous gas, but their compound Sodium Chloride (Table Salt) is an edible solid essential for life. Furthermore, compounds have sharp and fixed melting points and boiling points.

• Comparison with Mixtures: Mixtures are formed by the physical blending of two or more substances where no chemical reaction takes place. In a mixture, the components retain their original properties and can be separated by physical means. Mixtures do not have a fixed chemical formula or a fixed melting point.

• The Law of Definite Proportions: Also known as Proust's Law, it was formulated by the French chemist Joseph Proust in 1799. It states that a given chemical compound always contains its component elements in a fixed ratio (by mass) and does not depend on its source or method of preparation. This is a fundamental law in stoichiometry.

YourMockTest.com — Free Study Material

• Energy Changes: The formation of a compound is usually accompanied by a significant energy change in the form of heat, light, or sound (either exothermic or endothermic reactions), whereas the formation of a mixture involves little to no energy change.

Important Points

• Types of Compounds: Compounds can be classified into organic compounds (containing carbon-hydrogen bonds) and inorganic compounds. They can also be classified based on the type of bonding, such as ionic compounds (held by electrostatic forces) and covalent compounds (formed by sharing electrons).

• Electrolysis: This is a common electrochemical reaction used to decompose compounds. For example, during the electrolysis of water, electric current is passed through acidified water to yield Hydrogen gas at the cathode and Oxygen gas at the anode.

• Valency: The formation of a compound depends on the valency or combining capacity of the elements involved. The fixed composition of a compound is a direct result of the specific number of atoms of each element required to satisfy their valence shells and reach a stable electronic configuration.

Q22. Answer: (b) Vegetable oil

The correct answer is Vegetable oil.

• Vegetable oil is primarily composed of triglycerides, which are esters derived from glycerol and three fatty acids. These fatty acids consist of long carbon chains typically ranging from 12 to 22 carbon atoms in length.

• The "unstable" nature mentioned in the question refers to the unsaturated characteristic of most vegetable oils. Unsaturated fatty acids contain one or more double bonds within their carbon chains, which makes them chemically more reactive than saturated fats.

• These double bonds are sites where oxidation can occur, leading to the oil becoming rancid when exposed to air and light. This chemical reactivity is why they are considered "unstable" compared to shorter or fully saturated carbon structures.

• In contrast, Glucose has a relatively short and highly stable six-carbon chain (often forming a ring structure), while Water and Table salt are inorganic compounds that do not contain carbon chains at all.

• Structure of Vegetable Oils:

• Vegetable oils like sunflower oil, mustard oil, and groundnut oil are liquids at room temperature because the "kinks" created by double bonds in their unsaturated carbon chains prevent the molecules from packing closely together.

• The process of hydrogenation is often used in the food industry to convert these unstable liquid oils into saturated solid fats (like vanaspati ghee) by adding hydrogen across the double bonds in the presence of a Nickel catalyst.

• Glucose ($C_6H_{12}O_6$):

• It is a monosaccharide and serves as the primary energy source for living organisms.

• It contains only 6 carbon atoms, which is much shorter than the chains found in oils. Its structure is very stable under normal physiological conditions.

• Water (H_2O):

• Known as the universal solvent, water is an inorganic polar covalent compound.

• It contains zero carbon atoms and therefore does not possess carbon chains.

• Table Salt (NaCl):

• Scientifically known as Sodium Chloride, it is an ionic compound formed by the attraction between sodium cations and chloride anions.

• It forms a crystalline lattice structure and, like water, contains no carbon.

• Health Implications: Unsaturated vegetable oils are generally considered healthier for the human heart compared to saturated fats, as they help maintain better cholesterol levels, despite being chemically less stable.

• Carbon Chain Length: In organic chemistry, the stability of a molecule is often dictated by the types of chemical bonds (single vs. double vs. triple) rather than just the length. However, in the context of nutrition and lipids, long unsaturated chains are the hallmark of liquid oils.

• Reactivity: The presence of multiple double bonds makes an oil polyunsaturated. These are the most "unstable" and prone to polymerization and oxidation when heated to high temperatures (the smoke point).

Q23. Answer: (d) act on different bodies

The correct answer is act on different bodies.

Key Points

• Newton's Third Law of Motion states that whenever one object exerts a force on a second object, the second object exerts an equal and opposite force on the first. This is often summarized as "to every action, there is always an equal and opposite reaction."

• The action and reaction forces are always equal in magnitude but opposite in direction. They represent a mutual interaction between two entities.

• A fundamental characteristic of these forces is that they act on different bodies. For instance, if Body A exerts a force on Body B

(action), Body B exerts a force on Body A (reaction). Because they are applied to different objects, they do not cancel each other out. Hence, the statement in option 4 is correct.

• The forces do not produce the same effect on both bodies if their masses are different. According to Newton's Second Law (F = ma), the body with smaller mass will experience a greater acceleration compared to the body with larger mass. Hence, statement 1 is incorrect.

• Action and reaction forces never act in the same direction; they are always oriented 180 degrees apart. Hence, statement 2 is incorrect.

• If action and reaction were to act on the same body, the net force would always be zero, making acceleration or motion impossible for any object under interaction. Hence, statement 3 is incorrect.

Additional Information

• Newton's Laws of Motion: These three physical laws were first compiled by Sir Isaac Newton in his work Philosophiæ Naturalis Principia Mathematica, published in 1687. They form the foundation of classical mechanics.

• First Law (Law of Inertia): An object remains at rest or in uniform motion in a straight line unless acted upon by an external force.

• Second Law: The rate of change of momentum of an object is proportional to the applied force and takes place in the direction of the force. It is mathematically expressed as F = ma.

• Examples of the Third Law:

• Walking: When a person walks, they push the ground backward with their feet (action), and the ground pushes the person forward with an equal force (reaction).

• Recoil of a Gun: When a bullet is fired from a gun, the gun exerts a forward force on the bullet. The bullet exerts an equal and opposite backward force on the gun, causing it to recoil.

• Rocket Propulsion: A rocket accelerates by expelling gas backward at high velocity. The reacting force of the gas pushes the rocket forward in the vacuum of space.

Important Points

• Simultaneity: There is no time lag between action and reaction. They occur simultaneously. One is not the "cause" of the other in a chronological sense; they are two sides of a single interaction.

• Nature of Forces: Both the action and reaction forces are of the same nature. For example, if the action is a gravitational force, the reaction is also a gravitational force. If the action is a contact force (like friction or normal force), the reaction is also a contact force.

• Vector Quantity: Force is a vector quantity, meaning it has both magnitude and direction. The sum of the action-reaction vector pair across the system is zero, which is a basis for the Law of Conservation of Momentum.

Q24. Answer: (b) Muscles

The correct answer is Muscles.

Key Points

• Animal tissues are broadly classified into four types: Epithelial, Connective, Muscular, and Neural tissues.

• Muscles are made up of muscular tissue, which consists of elongated cells called muscle fibers. This tissue is responsible for the movement and locomotion of the body through contraction and relaxation. Hence, Muscles are NOT made of connective tissue.

• Connective tissues are the most abundant and widely distributed in the body of complex animals. They serve the function of linking and supporting other tissues/organs of the body.

• Blood is considered a fluid connective tissue because it contains plasma, red blood cells (RBC), white blood cells (WBC), and platelets, and it circulates throughout the body to transport nutrients and oxygen.

• Cartilage and Bone are types of specialized connective tissues. They provide the structural framework for the body and protect internal organs.

Additional Information

• Muscular Tissue:

• It is categorized into three types: Skeletal muscle (attached to bones and voluntary), Smooth muscle (found in walls of internal organs like the stomach and involuntary), and Cardiac muscle (found only in the heart).

• These tissues play a vital role in maintaining posture and generating heat within the body.

• Bone:

• Bones have a hard and non-pliable ground substance rich in calcium salts and collagen fibers which give bone its strength.

• The bone cells, known as osteocytes, are located in spaces called lacunae. They provide a structural frame to the body and interact with skeletal muscles to bring about movement.

• Cartilage:

• The intercellular material of cartilage is solid and pliable and resists compression.

• Cells of this tissue, called chondrocytes, are enclosed in small cavities within the matrix secreted by them. It is found in the tip of the nose, outer ear joints, and between adjacent bones of the vertebral column.

• Blood:

• It is the only connective tissue that is liquid. Unlike other connective tissues, the fibers are absent in blood unless it starts to clot.

• It serves as the main circulating fluid that helps in the transport of various substances like hormones, waste products, and gases.

Important Points

• Connective Tissue Proper: Includes Areolar tissue (serves as a support framework for epithelium) and Adipose tissue (located mainly beneath the skin and stores fats).

• Dense Connective Tissue: Includes Tendons, which attach skeletal muscles to bones, and Ligaments, which attach one bone to another.

• The primary difference between connective and muscular tissue is that connective tissue contains a large amount of extracellular matrix, whereas muscular tissue is primarily composed of cellular components designed for contractility.

Q25. Answer: (c) $2n^2$

The correct answer is $2n^2$.

Key Points

• The maximum number of electrons that can be accommodated in a particular shell is determined by the formula $2n^2$, where 'n' is the orbit number or principal quantum number.

• This formula was proposed as part of the Bohr-Bury scheme to explain the distribution of electrons in various energy levels surrounding the atomic nucleus.

• For the first shell (K shell), the value of n is 1; therefore, the maximum capacity is $2(1)^2 = 2$ electrons. Hence, the formula $2n^2$ is correct.

• For the second shell (L shell), the value of n is 2; therefore, the maximum capacity is $2(2)^2 = 8$ electrons. Hence, the formula $2n^2$ is correct.

• For the third shell (M shell), the value of n is 3; therefore, the maximum capacity is $2(3)^2 = 18$ electrons. Hence, the formula $2n^2$ is correct.

• For the fourth shell (N shell), the value of n is 4; therefore, the maximum capacity is $2(4)^2 = 32$ electrons. Hence, the formula $2n^2$ is correct.

Additional Information

• Bohr's Model of the Atom: Proposed by Niels Bohr in 1913, this model states that electrons move in discrete circular orbits called energy levels or shells. Electrons do not radiate energy while revolving in these stable orbits.

• Quantum Numbers: The principal quantum number (n) defines the main energy level of an electron. As the numerical value of n increases, the electron's distance from the nucleus and its energy level also increase.

• Shell Designations: The shells are represented by the letters K, L, M, N, O, P, etc., or by the numbers n = 1, 2, 3, 4, 5, 6. The K shell is closest to the nucleus and has the lowest energy.

• Subshells and Orbitals: Within each main shell, there are subshells labeled s, p, d, and f. Each subshell contains a specific number of orbitals, and each orbital can hold a maximum of 2 electrons with opposite spins.

• Octet Rule: Although the $2n^2$ rule defines the theoretical capacity, the outermost shell (valence shell) of a stable atom cannot accommodate more than 8 electrons, regardless of the shell's total capacity (except for the K shell, which is stable with 2 electrons).

Important Points

• Pauli Exclusion Principle: This principle, introduced by Wolfgang Pauli in 1925, states that no two electrons in an atom can have the identical set of four quantum numbers, ensuring that only two electrons occupy a single orbital.

• Electronic Configuration: The distribution of electrons across different shells and subshells is called electronic configuration. For example, Chlorine has an atomic number of 17, and its configuration is 2, 8, 7.

• Filling Sequence: According to the Aufbau Principle, electrons occupy the lowest energy shells first before filling higher energy levels. This ensures the stability of the atom in its ground state.

• Valency: The number of electrons in the outermost shell determines the valency of an element, which governs its chemical reactivity and bonding properties with other atoms.

Q26. Answer: (a) 2600

Shortcut Trick

When n identical cubes with edge a are joined in a row, the number of exposed square faces is (4n + 2).

Here, number of cubes n = 6 and edge a = 10 cm.

Total exposed faces = $(4 \times 6 + 2) = 26$ faces.

Surface Area = Number of faces $\times a^2 \Rightarrow 26 \times 10^2 = 2600$ cm².

Therefore The correct answer is 2600 cm².

Alternate Method

Given: Edge of each cube = 10 cm | Number of cubes = 6.

Formula Used: Total Surface Area (TSA) of Cuboid = 2(lb + bh + hl).

When cubes are joined end to end, the length of the resulting cuboid increases while breadth and height remain equal to the cube's edge.

=> Length (l) = 6 × 10 = 60 cm

=> Breadth (b) = 10 cm

=> Height (h) = 10 cm

=> TSA = 2(lb + bh + hl)

=> TSA = 2(60 × 10 + 10 × 10 + 10 × 60)

=> TSA = 2(600 + 100 + 600)

=> TSA = 2 × 1300

=> TSA = 2600 cm^2

Therefore The correct answer is 2600 cm^2.

Additional Information

Surface Area of a Cube

A cube has 6 identical square faces; hence the total surface area is $6a^2$ and the lateral surface area is $4a^2$.

Volume of the Resulting Solid

The volume remains the sum of individual volumes: Volume = n × a^3. For 6 cubes, V = 6 × 10^3 = 6000 cm^3.

Diagonal of a Cuboid

The longest rod that can be placed in a cuboid is its diagonal, given by d = $\sqrt{(l^2 + b^2 + h^2)}$.

Q27. Answer: (b) Rs. 7,812

Shortcut Trick

Use the ratio relationship between Marked Price (MP) and Cost Price (CP): MP ÷ CP = (100 + Gain%) ÷ (100 − Discount%).

MP ÷ 651 = (100 + 68) ÷ (100 − 86) = 168 ÷ 14.

MP ÷ 651 = 12.

MP = 651 × 12 = 7,812.

Therefore The correct answer is Rs. 7,812.

Alternate Method

Given: CP = Rs. 651, Gain% = 68%, Discount% = 86%. Formulas: SP = CP × (100 + Gain%) ÷ 100 | MP = SP × 100 ÷ (100 − Discount%).

=> Step 1: Find Selling Price (SP) = 651 × (168 ÷ 100) = 1,093.68.

=> Step 2: Since Discount is 86%, SP is 14% of Marked Price (MP).

=> Step 3: MP = 1,093.68 × 100 ÷ 14.

=> Step 4: MP = 109,368 ÷ 14 = 7,812.

Therefore The correct answer is Rs. 7,812.

Additional Information

Relation between CP and MP

CP ÷ MP = (100 − D%) ÷ (100 + G%). This ratio is the fastest way to solve problems involving both discount and gain percentage.

Marked Price

The price listed on the label of an article is the Marked Price (List Price). Discounts are always calculated on this value.

Q28. Answer: (a) 34.48%

Shortcut Trick

Use the Successive Discount formula: a + b − (a × b) ÷ 100.

Here, a = 16 and b = 22.

Equivalent Discount = 16 + 22 − (16 × 22) ÷ 100.

Equivalent Discount = 38 − (352 ÷ 100) = 38 − 3.52.

Equivalent Discount = 34.48%.

Therefore The correct answer is 34.48%.

Alternate Method

Given: First discount (d1) = 16%, Second discount (d2) = 22%.

Formula: Net Discount = [1 − (1 − d1/100) × (1 − d2/100)] × 100

=> Let the Marked Price (MP) be 100.

=> Price after 16% discount = 100 − 16 = 84.

=> Price after second discount (22% of 84) = 84 − (22/100 × 84) = 84 − 18.48.

=> Final Selling Price (SP) = 65.52.

=> Single equivalent discount = MP − SP = 100 − 65.52 = 34.48%.

Therefore The correct answer is 34.48%.

Additional Information

Successive Discounts

When two or more discounts are applied one after another, they are called successive discounts. The total effective discount is always less than the sum of individual discounts.

Marked Price & Discount

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

Q29. Answer: (b) 8 years

Shortcut Trick

Let Emma's age be 1 unit.

Sarah's age = 2 units + 5 years.

Total units = 1 + 2 + 5 = 29 => 3 units = 24.

1 unit = 8.

Therefore The correct answer is 8 years.

Alternate Method

Given:

Let Emma's age = x years.

Sarah's age = 2x + 5 years.

Sum of their ages = 29 years.

Calculations:

=> x + (2x + 5) = 29

=> 3x + 5 = 29

=> 3x = 29 − 5

=> 3x = 24

=> x = 24 ÷ 3

=> x = 8

Therefore The correct answer is 8 years.

Additional Information

Linear Equations in One Variable

An equation of the form ax + b = c, where x is the unknown variable and a, b, c are constants.

Age Relation Problems

Always define the base person's age as 'x' to simplify the relationship expressions for others.

Verification Method

Substitute the answer back: If Emma is 8, Sarah is (2 × 8) + 5 = 21. Sum: 8 + 21 = 29. Correct.

Q30. Answer: (a) 9:2

Shortcut Trick

Fourth Proportional of 10, 15, 18 = (15 × 18) ÷ 10 = 270 ÷ 10 = 27

Mean Proportional of 9 and 4 = √(9 × 4) = √36 = 6

Required Ratio = 27 : 6 = 9 : 2

Therefore The correct answer is 9:2.

Alternate Method

Given: Numbers for Fourth Proportional (a=10, b=15, c=18) and Mean Proportional (x=9, y=4).

Formula Used: Fourth Proportional (d) = (b × c) ÷ a; Mean Proportional = √(x × y)

=> Fourth Proportional (d) = (15 × 18) ÷ 10

=> d = 270 ÷ 10 = 27

YourMockTest.com — Free Study Material

=> Mean Proportional (m) = √(9 × 4)
=> m = √36 = 6
=> Ratio = 27 : 6 = 9 : 2
Therefore The correct answer is 9:2.
Additional Information
Third Proportional
For two numbers a and b, the third proportional c is such that a : b :: b : c, given by $c = b^2 / a$.
Mean Proportional Definition
The mean proportional between two numbers a and b is the geometric mean, calculated as √(a × b).
Continued Proportion
Three quantities a, b, c are in continued proportion if a/b = b/c, where b is the mean proportional.

Q31. Answer: (d) 14025

Shortcut Trick
Let the number be N.
Translate the percentage and fraction: 80% = 4/5 and 10% = 1/10.
The equation becomes: N × (4/5) × (1/10) × (2/3) = 748.
Simplify: N × (8/150) = 748 => N = (748 × 150) ÷ 8.
N = 93.5 × 150 = 14025.
Therefore The correct answer is 14025.
Alternate Method
Given:
Product result = 748
Percentage 1 = 80%
Percentage 2 = 10%
Fraction = 2/3
Calculations:
=> (80/100) × (10/100) × (2/3) × N = 748
=> (4/5) × (1/10) × (2/3) × N = 748
=> (8/150) × N = 748
=> N = (748 × 150) ÷ 8
=> N = 112200 ÷ 8
=> N = 14025
Therefore The correct answer is 14025.
Additional Information
Percentage to Fraction Conversion
To convert a percentage to a fraction, divide the value by 100. For example, x% = x/100.
Successive Percentage Application
When multiple percentages or fractions are applied to a number, they are multiplied together as factors.
Reciprocal Multiplication
To find the original value from a final result, multiply the result by the reciprocal of each applied fraction.

Q32. Answer: (a) 12.5

Shortcut Trick
Total Cost Price (CP) of 9 articles = Rs. 16.
Total Selling Price (SP) of 9 articles = 9 × 2 = Rs. 18.
Profit = SP − CP = 18 − 16 = Rs. 2.
Profit % = (Profit ÷ CP) × 100 = (2 ÷ 16) × 100.
Profit % = (1 ÷ 8) × 100 = 12.5%.
Therefore The correct answer is 12.5%.
Alternate Method
Given → CP of 9 articles = Rs. 16, SP of 1 article = Rs. 2. Formulas: Profit = SP − CP | Profit % = (Profit ÷ CP) × 100.

YourMockTest.com — Free Study Material

=> Cost Price (CP) for 9 articles = Rs. 16. => Selling Price (SP) for 1 article = Rs. 2. => SP for 9 articles = 9 × 2 = Rs. 18. => Profit = 18 − 16 = Rs. 2. => Profit Percentage = (2 ÷ 16) × 100 = 12.5%.

Therefore The correct answer is 12.5%.

Additional Information

Profit and Loss Calculation

Profit occurs when SP > CP. Profit % is always calculated on the CP unless stated otherwise.

Unitary Method

You can also find CP of 1 article (16 ÷ 9) and compare it with SP of 1 article (2) to get the same result.

Q33. Answer: (a) 80

Shortcut Trick

Mode is defined as the value that appears most frequently in a data set.

By observing the given data, the value 80 appears 5 times.

All other values such as 81 (3 times), 66 (3 times), and others appear less than 5 times.

Therefore, the maximum frequency corresponds to the number 80.

Therefore The correct answer is 80.

Alternate Method

Given: Data set = {75, 70, 80, 70, 80, 71, 80, 66, 87, 82, 68, 73, 80, 75, 66, 64, 66, 87, 90, 68, 89, 82, 81, 81, 65, 81, 80}

To find the Mode, we construct a Frequency Table for the observed values:

=> Value 80: Observed at positions 3, 5, 7, 13, 27 → Frequency = 5

=> Value 81: Observed at positions 23, 24, 26 → Frequency = 3

=> Value 66: Observed at positions 8, 15, 17 → Frequency = 3

=> Value 75: Observed at positions 1, 14 → Frequency = 2

=> Value 70: Observed at positions 2, 4 → Frequency = 2

=> Value 87: Observed at positions 9, 18 → Frequency = 2

=> Value 82: Observed at positions 10, 22 → Frequency = 2

=> Value 68: Observed at positions 11, 20 → Frequency = 2

=> Other values (64, 65, 71, 73, 89, 90) each have a frequency of 1.

=> Comparing frequencies: 5 > 3 > 2 > 1.

=> Since 80 has the highest frequency (5), it is the Mode.

Therefore The correct answer is 80.

Additional Information

Definition of Mode

The mode is the value that appears most often in a set of data. A data set can be unimodal (one mode), bimodal (two modes), or multimodal.

Empirical Relationship

For a moderately skewed distribution, the relationship between mean, median, and mode is: Mode = 3 × Median − 2 × Mean.

Median and Mean

Mean is the average of all observations, while Median is the middle value when data is arranged in ascending or descending order.

Q34. Answer: (c) 3

Shortcut Trick

To find the greatest number leaving the same remainder, calculate the HCF of the differences between the numbers.

Differences: (59 − 47) = 12, (74 − 59) = 15, and (74 − 47) = 27.

HCF of 12, 15, and 27 is 3.

Therefore The correct answer is 3.

Alternate Method

Given: Numbers are 47, 59, and 74.

Formula: For the same remainder, the number is HCF(|x−y|, |y−z|, |z−x|).

=> Difference 1 = 59 − 47 = 12

=> Difference 2 = 74 − 59 = 15

=> Difference 3 = 74 − 47 = 27

=> Prime factors of 12 = $2^2 \times 3$

=> Prime factors of 15 = 3×5

=> Prime factors of 27 = 3^3

=> HCF(12, 15, 27) = 3

Therefore The correct answer is 3.

Additional Information

HCF with Same Remainder

The greatest number which divides x, y, and z leaving the same remainder in each case is HCF of (x−y), (y−z), and (z−x).

HCF with Different Remainders

To find the greatest number that divides x, y, z to leave remainders a, b, c, find HCF of (x−a), (y−b), and (z−c).

LCM Applications

LCM is used for finding the smallest number divisible by given values or finding when events (like bells ringing) occur together.

Q35. Answer: (c) 2 : 17

Shortcut Trick

The ratio of Total Surface Area (TSA) depends on the factor r(r + h) since 2π is constant.

For Original Cylinder: Factor1 = 5 × (5 + 12) = 5 × 17 = 85

For Small Cylinder: Factor2 = 2 × (2 + 3) = 2 × 5 = 10

Required Ratio (Small : Original) = 10 : 85 = 2 : 17

Therefore The correct answer is 2 : 17.

Alternate Method

Given:

Original Cylinder: Radius (R) = 5 cm, Height (H) = 12 cm

Small Cylinder: Radius (r) = 2 cm, Height (h) = 3 cm

Formula Used:

Total Surface Area (TSA) of a Cylinder = $2\pi r(r + h)$

Calculations:

=> TSA of Original Cylinder = $2 \times \pi \times R \times (R + H)$

=> TSA_(Original) = $2 \times \pi \times 5 \times (5 + 12) = 10\pi \times 17 = 170\pi$ cm^2

=> TSA of one Small Cylinder = $2 \times \pi \times r \times (r + h)$

=> TSA_(Small) = $2 \times \pi \times 2 \times (2 + 3) = 4\pi \times 5 = 20\pi$ cm^2

=> Required Ratio = TSA_(Small) : TSA_(Original)

=> Required Ratio = $20\pi : 170\pi = 20 : 170 = 2 : 17$

Therefore The correct answer is 2 : 17.

Additional Information

Volume of a Cylinder

The amount of space occupied by a cylinder is given by the formula $V = \pi r^2 h$.

Curved Surface Area (CSA)

The area of the curved part of the cylinder is $2\pi rh$. Total surface area includes the two circular bases: TSA = CSA + $2\pi r^2$.

Melting and Recasting Rule

When a solid is melted and recast into other shapes, its total Volume remains constant. Volume_(Original) = n × Volume_(Small).

Q36. Answer: (c) 1

Shortcut Trick

If sinA = 1/2, then the angle A = 30°.

Substituting A in sin3A → sin(3 × 30°) = sin90°.

The value of sin90° is 1.

Therefore The correct answer is 1.

Alternate Method

Given: sinA = 1/2

Formula Used: $\sin 3A = 3\sin A - 4\sin^3 A$

=> $\sin 3A = 3 \times (1/2) - 4 \times (1/2)^3$

=> sin3A = 3/2 − 4 × (1/8)
=> sin3A = 3/2 − 1/2
=> sin3A = 2/2 = 1
Therefore The correct answer is 1.
Additional Information
Trigonometric Triple Angle Formulas
The formula for sin3A is 3sinA − 4sin³A and for cos3A is 4cos³A − 3cosA.
Standard Values of Sine
sin0° = 0, sin30° = 1/2, sin45° = 1/√2, sin60° = √3/2, sin90° = 1.
Range of Sine Function
The value of sinθ for any real θ always lies in the interval [−1, 1].

Q37. Answer: (b) 67°

Shortcut Trick
In ΔBDC, angle C = 90° − angle DBC = 90° − 76° = 14°.
In ΔAEC, angle AEB is the exterior angle at vertex E.
By the Exterior Angle Theorem: angle AEB = angle CAE + angle C.
angle AEB = 53° + 14° = 67°.
Therefore The correct answer is 67°.
Alternate Method
Given: In ΔABC, BD perpendicular to AC at D, angle DBC = 76°, and angle CAE = 53°.
Formula Used: Angle Sum Property of a triangle and Exterior Angle Theorem.
In ΔBDC:
=> angle BDC = 90° (Given BD perpendicular to AC)
=> angle DBC = 76° (Given)
=> angle C = 180° − (angle BDC + angle DBC)
=> angle C = 180° − (90° + 76°) = 14°.
In ΔAEC:
=> angle CAE = 53° (Given)
=> angle ACE = 14° (Calculated above)
=> angle AEB is the exterior angle to ΔAEC at vertex E.
=> angle AEB = angle CAE + angle ACE
=> angle AEB = 53° + 14° = 67°.
Therefore The correct answer is 67°.
Additional Information
Exterior Angle Theorem
The measure of an exterior angle of a triangle is equal to the sum of the measures of its two remote interior angles.
Angle Sum Property
The sum of all interior angles of any triangle is always 180°.
Complementary Angles
In a right-angled triangle, the two acute angles are complementary, meaning their sum is exactly 90°.

Q38. Answer: (d) Increase by 10.4%

Shortcut Trick
Let TV cost = 100, then Washing Machine (WM) cost = 75.
Ratio of cost WM : TV = 3 : 4. For 8 WM and 4 TV, cost ratio = (8 × 3) : (4 × 4) = 24 : 16 = 3 : 2.
Using Weighted Average: % Change = [(3 × 30%) + (2 × −19%)] ÷ (3 + 2).
% Change = (90 − 38) ÷ 5 = 52 ÷ 5 = 10.4%.
Since the result is positive, it is an increase.
Therefore The correct answer is Increase by 10.4%.
Alternate Method
Given → TV cost = 100, WM cost = 75 (25% less). Formulas: Total Cost = (Quantity1 × Price1) + (Quantity2 × Price2) | % Change

= (Change ÷ Original) × 100.

=> Initial Total Cost = (8 × 75) + (4 × 100) = 600 + 400 = 1000. => New WM Cost = 75 + 30% of 75 = 75 + 22.5 = 97.5. => New TV Cost = 100 − 19% of 100 = 81. => New Total Cost = (8 × 97.5) + (4 × 81) = 780 + 324 = 1104. => Percentage Change = [(1104 − 1000) ÷ 1000] × 100 = (104 ÷ 1000) × 100 = 10.4%.

Therefore The correct answer is Increase by 10.4%.

Additional Information

Weighted Average Percentage

When different components of a total change by different percentages, the net change is the sum of (weight × individual change) divided by the total weight.

Percentage Increase/Decrease

Percentage change = [(Final Value − Initial Value) ÷ Initial Value] × 100. A positive value indicates an increase, while a negative value indicates a decrease.

Q39. Answer: (a) 54 minutes

Shortcut Trick

Let Total Work = LCM(30, 45, 24) = 360 units.

Efficiencies: A = 12, B = 8, C = −15.

Work done by A + B in first 6 minutes = (12 + 8) × 6 = 120 units.

Remaining work = 360 − 120 = 240 units. Combined efficiency (A+B+C) = 12 + 8 − 15 = 5.

Time for remaining part = 240 ÷ 5 = 48 minutes. Total time = 6 + 48 = 54 minutes.

Therefore The correct answer is 54 min.

Alternate Method

Given: Pipe A fills in 30 min, Pipe B fills in 45 min, Pipe C empties in 24 min.

Person	Days	Total Work	Efficiency
Pipe A	30 min	360 units	12
Pipe B	45 min	8	
Pipe C	24 min	−15	

=> Work done in first 6 min = (Eff_A + Eff_B) × 6

=> Work done = (12 + 8) × 6 = 120 units

=> Remaining work = 360 − 120 = 240 units

=> Combined efficiency of A, B, and C = 12 + 8 − 15 = 5 units/min

=> Time taken to complete remaining work = 240 ÷ 5 = 48 min

=> Total time required = Initial time + Remaining time = 6 + 48 = 54 min

Therefore The correct answer is 54 min.

Additional Information

Pipes and Cisterns Efficiency

Filling pipes have positive efficiency, while emptying (outlet) pipes have negative efficiency in calculations.

Total Work Calculation

Total capacity of the tank is usually taken as the LCM of the individual times to simplify division.

Combined Rate

When pipes operate together, the net rate is the algebraic sum of their individual rates: Net Rate = R1 + R2 − R_(outlet).

Q40. Answer: (d) 28

Shortcut Trick

Given a + b = 4 and ab = 3.

Use the direct identity: $a^3 + b^3 = (a + b)^3 − 3ab(a + b)$.

Substitute the values: $4^3 − 3 × 3 × 4$

Value = 64 − 36 = 28.

Therefore The correct answer is 28.

Alternate Method

Given:

Sum of terms (a + b) = 4
Product of terms (ab) = 3
Formula Used:
$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
Calculations:
=> $(4)^3 = a^3 + b^3 + 3 \times 3 \times 4$
=> $64 = a^3 + b^3 + 36$
=> $a^3 + b^3 = 64 - 36$
=> $a^3 + b^3 = 28$
Therefore The correct answer is 28.
Additional Information
Sum of Cubes Formula
The algebraic identity for the sum of two cubes is $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$.
Difference of Cubes Formula
The algebraic identity for the difference of two cubes is $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$.
Standard Binomial Expansion
The cube of a sum is expanded as $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$, which simplifies to $a^3 + b^3 + 3ab(a + b)$.

Q41. Answer: (c) 37.5%

Shortcut Trick
Ratio of Income : Expenditure = 8 : 5.
Saving = Income − Expenditure = 8 − 5 = 3 units.
Saving % = (Saving ÷ Income) × 100 = (3 ÷ 8) × 100.
Since 1/8 = 12.5%, then 3/8 = 3 × 12.5% = 37.5%.
Therefore The correct answer is 37.5%.
Alternate Method
Given: Ratio of Income (I) to Expenditure (E) is 8 : 5.
Formula Used: Saving (S) = Income − Expenditure; Saving % = (S/I) × 100
=> Let Income = 8x and Expenditure = 5x
=> Saving = 8x − 5x = 3x
=> Saving Percentage = (3x ÷ 8x) × 100
=> Saving Percentage = 0.375 × 100
=> Saving Percentage = 37.5%
Therefore The correct answer is 37.5%.
Additional Information
Income-Expenditure Identity
Total Income is always the sum of Expenditure and Savings (I = E + S).
Percentage Conversion
To find the percentage of Savings, always use Income as the base (denominator) unless specified otherwise.
Common Fraction to Percentage
1/8 = 12.5%, 2/8 (1/4) = 25%, 3/8 = 37.5%, 4/8 (1/2) = 50%.

Q42. Answer: (d) 4

Shortcut Trick
Combined efficiency of A, B, and C = (1/3 + 1/3 + 1/12) = 9/12 = 3/4 units/day.
Days taken for same work = 1 ÷ (3/4) = 4/3 days.
Days taken for thrice the work = 3 × (4/3) = 4 days.
Therefore The correct answer is 4 days.
Alternate Method
Given: Days taken by A = 3, B = 3, C = 12.
Formula Used: Total Work = LCM of days; Efficiency = Total Work ÷ Days; Time = Total Work ÷ Total Efficiency.

Person	Days	Total Work	Efficiency

YourMockTest.com — Free Study Material

A	3	12 units	4
B	3	4	
C	12	1	

=> Total Efficiency of A + B + C = 4 + 4 + 1 = 9 units/day.

=> Work to be completed = 3 × Total Work = 3 × 12 = 36 units.

=> Time taken = 36 ÷ 9 = 4 days.

Therefore The correct answer is 4 days.

Additional Information

Work-Efficiency Relation

Efficiency is inversely proportional to the time taken to complete the work. More efficiency means less time.

Work and Wages

Wages are distributed in the ratio of work done or the ratio of efficiencies when all persons work for the same duration.

Pipes and Cisterns

Similar logic applies where filling pipes have positive efficiency and leakage/outlet pipes have negative efficiency.

Q43. Answer: (c) 45, 25

Shortcut Trick

Let the price of a short notebook be x. Then the long notebook price is x + 20.

According to the question: 4(x + 20) + 5x = 305

9x + 80 = 305 => 9x = 225 => x = 25.

Price of long notebook = 25 + 20 = 45.

Therefore The correct answer is 45, 25.

Alternate Method

Given:

Total cost of 4 long and 5 short notebooks = Rs. 305.

Difference in price = Rs. 20.

Formula Used:

Formation of Linear Equations: Total Cost = (Quantity1 × Price1) + (Quantity2 × Price2).

Calculations:

Let L be the price of a long notebook and S be the price of a short notebook.

=> 4L + 5S = 305 --- (Eq. 1)

=> L − S = 20 => L = S + 20 --- (Eq. 2)

Substituting the value of L from (Eq. 2) into (Eq. 1):

=> 4(S + 20) + 5S = 305

=> 4S + 80 + 5S = 305

=> 9S = 305 − 80

=> 9S = 225

=> S = 25

Now, finding the value of L:

=> L = 25 + 20 = 45

Therefore The correct answer is 45, 25.

Additional Information

Substitution Method

A process of solving a system of equations by expressing one variable in terms of the other and substituting it into the remaining equation.

Elimination Method

A technique where equations are added or subtracted to eliminate one variable, making it easier to solve for the other.

Linear Equation in Two Variables

An algebraic equation in which each term has an exponent of one and the graphing of the equation results in a straight line, typically written as ax + by = c.

YourMockTest.com — Free Study Material

Q44. Answer: (b) 7

Shortcut Trick

Convert all to base 2:

32 = 2^5, 64 = 2^6, 16 = 2^4, 4 = 2^2

Expression inside root:

= 2^5 × (2^6)^(−2) × 2 × (2^4)^(−3) × (2^2)^(m+3)

=> = 2^(5 − 12 + 1 − 12 + 2m + 6)

=> = 2^(2m − 12)

Square root => power becomes half:

=> = 2^((2m − 12)/2) = 2^(m − 6)

Given value = 2 => 2^(m−6) = 2^1

=> m − 6 = 1 => m = 7

Therefore Answer = 7

Alternate Method

Given:

√(32 × 64^(−2) × 2 / 16^3 × 4^(m+3)) = 2

Formula used:

a^m × a^n = a^(m+n), (a^m)^n = a^(mn)

Calculation:

=> Convert to base 2 and combine powers

=> Inside root = 2^(2m − 12)

=> After square root = 2^(m − 6)

=> 2^(m − 6) = 2

=> m − 6 = 1

=> m = 7

Therefore The correct answer is 7.

Additional Information

Exponent Rule

Convert all numbers to same base for easy simplification.

Square Root Rule

√(a^n) = a^(n/2)

Power Matching

If bases are same, equate exponents.

Q45. Answer: (c) 180 km

Shortcut Trick

Speed is constant → Distance is directly proportional to Time.

Ratio of Time = 6 : 4.5 = 4 : 3

4 units = 240 km

1 unit = 60 km

3 units = 3 × 60 = 180 km

Therefore The correct answer is 180 km.

Alternate Method

Given:

Distance1 = 240 km

Time1 = 6 hours

Time2 = 4.5 hours

Formula Used:

Speed = Distance ÷ Time

Distance = Speed × Time

Calculations:

=> Speed of the bus = 240 ÷ 6

=> Speed = 40 kmph
=> New Distance = Speed × New Time
=> New Distance = 40 × 4.5
=> New Distance = 180 km
Therefore The correct answer is 180 km.
Additional Information
Direct Proportionality
When speed is constant, distance (D) is directly proportional to time (T), expressed as D1/T1 = D2/T2.
Average Speed
Average Speed = Total Distance ÷ Total Time. For two equal distances with speeds u and v, Average Speed = 2uv/(u+v).
Unit Conversion
To convert kmph to m/s, multiply by 5/18. To convert m/s to kmph, multiply by 18/5.

Q46. Answer: (c) 125 minutes

Shortcut Trick
Speed ratio = 5 : 6 → Time ratio = 6 : 5 (since distance is constant).
Difference in time ratio parts = 6 − 5 = 1 unit.
Given 1 unit = 25 minutes.
Usual time = 5 units = 5 × 25 = 125 minutes.
Therefore The correct answer is 125 min.
Alternate Method
Given: New speed = 5/6 of normal speed, Time delay = 25 minutes.
Formula Used: Distance = Speed × Time. If distance is constant, Speed prop. to 1/Time.
=> Let normal speed be S and usual time be T.
=> Normal Distance = S × T
=> New Distance = (5/6)S × (T + 25)
=> S × T = (5/6)S × (T + 25)
=> T = 5/6(T + 25)
=> 6T = 5T + 125
=> T = 125 minutes.
Therefore The correct answer is 125 min.
Additional Information
Inverse Proportion of Speed and Time
When the distance is constant, the ratio of speeds is inversely proportional to the ratio of time taken: S1/S2 = T2/T1.
Late/Early Concept Shortcut
Usual Time = (Late Time × Numerator) ÷ (Difference between Numerator and Denominator) = (25 × 5) ÷ (6 − 5) = 125 min.
Average Speed
If a person covers two equal distances at speeds x and y, the average speed is 2xy/(x+y).

Q47. Answer: (a) 0

The solution is in Hindi. Read it online.

Q48. Answer: (b) Rs. 10,092

Shortcut Trick
Rate = 16% = 4/25 => Ratio of Principal to Amount for 1 year = 25 : 29.
For 2 years, the ratio becomes $25^2 : 29^2 = 625 : 841$.
Given 625 units = Rs. 7500 => 1 unit = Rs. 12.
Total Amount = 841 units × 12 = Rs. 10,092.
Therefore The correct answer is Rs. 10,092.
Alternate Method
Given:
Principal (P) = Rs. 7,500
Rate of Interest (R) = 16% per annum

Time (n) = 2 years

Formula Used:

Amount (A) = $P(1 + R/100)^n$

Calculations:

=> $A = 7500 \times (1 + 16/100)^2$

=> $A = 7500 \times (116/100) \times (116/100)$

=> $A = 7500 \times (29/25) \times (29/25)$

=> $A = (7500 \div 625) \times (29 \times 29)$

=> $A = 12 \times 841$

=> $A = 10092$

Therefore The correct answer is Rs. 10,092.

Additional Information

Effective Rate of Interest

For 2 years at R%, the effective compound interest rate is R + R + (R×R)/100. For 16%, it is 16 + 16 + 2.56 = 34.56%.

CI vs SI Difference

The difference between Compound Interest and Simple Interest for 2 years is given by $P(R/100)^2$.

Successive Percentage Change

Compound interest is essentially a successive percentage increase on the initial principal value over the given time periods.

Q49. Answer: (b) 10.1

Shortcut Trick

Use the direct empirical relationship formula: Mean = (3 × Median − Mode) ÷ 2.

Substitute the given values: (3 × 31 − 72.8) ÷ 2.

=> (93 − 72.8) ÷ 2 = 20.2 ÷ 2 = 10.1.

Therefore The correct answer is 10.1.

Alternate Method

Given:

Mode of the data = 72.8

Median of the data = 31

Formula Used:

The Empirical Relationship between measures of central tendency is:

Mode = 3 × Median − 2 × Mean

Calculations:

=> 72.8 = 3 × 31 − 2 × Mean

=> 72.8 = 93 − 2 × Mean

=> 2 × Mean = 93 − 72.8

=> 2 × Mean = 20.2

=> Mean = 20.2 ÷ 2

=> Mean = 10.1

Therefore The correct answer is 10.1.

Additional Information

Empirical Formula for Skewed Distributions

For moderately asymmetrical distributions, the relationship is Mean − Mode = 3(Mean − Median), which simplifies to Mode = 3 Median − 2 Mean.

Types of Skewness

In a Symmetric Distribution, Mean = Median = Mode. In a Positively Skewed distribution, Mean > Median > Mode. In a Negatively Skewed distribution, Mode > Median > Mean.

Measures of Central Tendency

Mean is the average, Median is the middle value, and Mode is the most frequent value in a data set.

Q50. Answer: (b) Rs. 1,211

Shortcut Trick

Total amount to be divided = Rs. 10,896.

Total deductions = 91 + 4 + 57 = Rs. 152.

Remaining amount = 10,896 − 152 = Rs. 10,744.

Divide Rs. 10,744 in ratio 3 : 8 : 6 (Total units = 17).

Difference between B and C shares (after deduction) = 8 − 6 = 2 units.

Difference between original shares = (Value of 2 units) + (Difference in deductions) = (10,744 ÷ 17 × 2) + (4 − 57) = 1,264 − 53 = Rs. 1,211.

Therefore The correct answer is Rs. 1,211.

Alternate Method

Given: Total sum = Rs. 10,896. Deductions from A, B, C are Rs. 91, Rs. 4, Rs. 57. Ratio after deduction = 3 : 8 : 6.

Calculations:

=> Sum of ratio parts = 3 + 8 + 6 = 17 units

=> Total deduction = 91 + 4 + 57 = Rs. 152

=> Remaining amount = 10,896 − 152 = Rs. 10,744

=> Value of 1 unit = 10,744 ÷ 17 = Rs. 632

=> B's share after deduction = 8 × 632 = Rs. 5,056

=> B's original share = 5,056 + 4 = Rs. 5,060

=> C's share after deduction = 6 × 632 = Rs. 3,792

=> C's original share = 3,792 + 57 = Rs. 3,849

=> Required Difference = 5,060 − 3,849 = Rs. 1,211

Therefore The correct answer is Rs. 1,211.

Additional Information

Ratio and Proportion

If a sum S is divided in ratio a:b:c, the shares are [a/(a+b+c)]×S, [b/(a+b+c)]×S, and [c/(a+b+c)]×S respectively.

Deduction problems

Always subtract the specific deductions from the total sum before applying the ratio units to find the individual shares.

Q51. Answer: (d) 45

BODMAS Table:

Decoding the given information:

Alphabet	•	−	×	÷
Meaning	÷	×	−	•

Now, replacing the sign from left to right using BODMAS Rule, we get:

=> 608 ÷ 76 − 6 × 37 + 259 = ?

=> 8 − 222 + 259 = ?

=> 267 − 222 = ?

=> 45

Hence, the correct option is "Option 4".

Q52. Answer: (d) 12th

Given:

Mr. Hepa is 9th from the left end and Mr. Annu sits 56 places to the right of Mr. Hepa in a row of 76 students.

Here,

Mr. Annu’s position from the left end = 9 + 56 = 65th

Now, Mr. Annu’s position from the right end = 76 − 65 + 1 = 12th

So, Mr. Annu is 12th from the right end.

Hence, the correct answer is "Option 4".

Q53. Answer: (c) More than three

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

Now,

Even numbers, which are immediately preceded by an odd number and also immediately followed by an odd number.

So, Needed pattern is: Odd Number - Even Number - Odd Number

YourMockTest.com – Free Study Material

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

So, total valid even numbers = 4

Hence, the correct answer is Option 3.

Q54. Answer: (d) 5

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

Now,

Odd numbers, which are immediately preceded by an even number and also immediately followed by an odd number.

So, Needed pattern is: Even Number - Odd Number - Odd Number

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

So, total valid odd numbers = 5

Hence, the correct answer is Option 4.

Q55. Answer: (d) 22

BODMAS Table:

Decoding the given information:

Alphabet	**•**	**−**	**×**	**÷**
Meaning	−	•	÷	×

Now, replacing the sign from left to right using BODMAS Rule, we get:

=> 9 × 2 − 24 ÷ 6 + 3 = ? − 5

=> 18 − 4 + 3 = ? − 5

=> 14 + 3 = ? − 5

=> 17 = ? − 5

=> ? = 17 + 5

=> ? = 22

Hence, the correct option is "Option 4".

Q56. Answer: (c) 4

The logic followed here is:

thus, "4" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q57. Answer: (a) 20 - 2 - 10

The logic followed here is:

Logic: First Number = Second Number × Third Number.

For, (15 - 3 - 5) →

=> 3 × 5 = 15

For, (24 - 4 - 6) →

=> 4 × 6 = 24

Now, checking the options:

Option 1) (20 - 2 - 10)

=> 2 × 10 = 20

Option 2) (35 - 5 - 8)

=> 5 × 8 = 40 ≠ 35

Option 3) (63 - 7 - 11)

=> 7 × 11 = 77 ≠ 63

Option 4) (50 - 3 - 19)

=> 3 × 19 = 57 ≠ 50

Hence, the correct answer is Option 1.

Q58. Answer: (a) Both conclusions (I) and (II) follow

Given Statements:

All rings are kettles.

All dogs are bottles.

No rings are bottles.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some kettles are not dogs – Follows (Rings are kettles and no rings are bottles. Since all dogs are bottles, rings cannot be dogs. Therefore, some kettles are not dogs).

II. No rings are dogs – Follows (All dogs are bottles and no rings are bottles, so rings cannot be dogs).

So, both conclusion I and conclusion II follow.

Hence, the correct answer is "Option 1".

Q59. Answer: (c) Two

Given: A, B, C, D, E and F are sitting in a row facing north.

A sits third to the left of E.

E sits second to the left of F.

D sits to the immediate right of E.

B sits to the immediate left of C.

Now,

People between C and F → E and D = 2

Hence, the correct answer is "Option 3".

Q60. Answer: (a) 10

Given: 745, 768, 729, 716, 721

Now, the second digit of the second highest number and the third digit of the lowest number, then add them.

Descending order: 768 > 745 > 729 > 721 > 716

Second highest number = 745

Second digit of second highest number = 4

Lowest number = 716

Third digit of lowest number = 6

So, 4 + 6 = 10

Hence, the correct answer is Option 1.

Q61. Answer: (a) EF−HL

The logic followed here is:

Option 1) EF – HL

Option 2) VW – ZA

Option 3) OP – ST

Option 4) MN – QR

Here, EF – HL is odd from the given options.

Hence, the correct answer is "Option 1".

Q62. Answer: (a) Only conclusion (I) follows

Given Statements:

Some easels are brushes.

Some canvases are brushes.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some brushes are canvases – Follows (From “Some canvases are brushes”, it follows that some brushes are canvases).

II. All easels are canvases – Does not follow (No direct relation is given between easels and canvases).

So, only conclusion I follows.

Hence, the correct answer is "Option 1".

Q63. Answer: (d) 82 km towards the south

The logic followed here is:
Given:
Karthik starts from Point Y and drives 86 km towards the east.
He then takes a right turn, drives 41 km, turns right and drives 61 km.
He then takes a right turn and drives 92 km.
He takes a left turn, drives 25 km.
He then turns right, drives 31 km and stops at Point Z

So,To reach back to Point Y, he must move 82 km towards the South
Hence, the correct answer is Option 4.

Q64. Answer: (b) 224

The logic followed here is:
thus, "224" will replace the question mark in the given series.
Hence, the correct option is "Option 2".

Q65. Answer: (a) mp

The logic followed here is:
Given:
'dirt is there' → mp rc gp
'clean the dirt' → hk mp bo
So, the code for dirt = mp.
Hence, the correct answer is Option 1.

Q66. Answer: (d) 60

The logic followed here is:
thus, "60" will replace the question mark in the given series.
Hence, the correct option is "Option 4".

Q67. Answer: (a) Son's wife's father

Family Chart:
Decoding the Symbols:

Symbol	•	–	×	&
Meaning	Son	Brother	Wife	Father

Given: K & T − R × Z + V
It means: K is the father of T, T is the brother of R, R is the wife of Z, and Z is the son of V.
Therefore, K is related to V as son's wife's father.
Hence, the correct answer is "Option 1".

Q68. Answer: (c) Three

Given: (Left) 2 5 6 4 9 7 8 4 3 1 7 8 3 5 6 4 8 5 7 1 2 9 7 5 8 6 4 (Right)
Now,
Even numbers, which are immediately preceded by an even number and also immediately followed by an odd number.
So, Needed pattern is: Even Number - Even Number - Odd Number
(Left) 2 5 6 4 9 7 8 4 3 1 7 8 3 5 6 4 8 5 7 1 2 9 7 5 8 6 4 (Right)
So, total valid even numbers = 3
Hence, the correct answer is Option 3.

Q69. Answer: (a) 3

Given: A, B, C, D and E are sitting in a row facing north.
D sits at the extreme left end of the row.
E sits third to the right of A.

YourMockTest.com — Free Study Material

B sits to the immediate right of A.
Now, People between D and E → A, B, C = 3
Hence, the correct answer is "Option 1".

Q70. Answer: (a) an

The logic followed here is:
Given:
'move the rocks' → ld an ur
'rocks block roads' → mp cq an
So, the code for rocks = an.
Hence, the correct answer is Option 1.

Q71. Answer: (b) ECY 116

The logic followed here is:
So, the missing term = ECY 116
Hence, the correct answer is Option 2.

Q72. Answer: (a) POSR

The logic followed here is:
For MLPO → NMQP
Now, for GFJI → HGKJ
Now, applying the same logic for ONRQ:
So, ONRQ → POSR
Hence, the correct answer is "Option 1".

Q73. Answer: (d) 1080

BODMAS Table:
Decoding the given information:

Alphabet	**•**	**−**	**×**	**÷**
Meaning	−	×	÷	•

Now, replacing the sign from left to right using BODMAS Rule, we get:
=> 97 × 11 + 67 − 864 ÷ 16 = ?
=> 1067 + 67 − 54 = ?
=> 1134 − 54 = ?
=> 1080
Hence, the correct option is "Option 4".

Q74. Answer: (c) JE83

The logic followed here is:
For IS69 → LO61
Now, verify with WE43 → ZA35
Now, applying the same logic for GI91:
So, GI91 → JE82
Hence, the correct answer is "Option 3".

Q75. Answer: (b) 30

Given:
Kiran is 10th from the left end and Sandeep is 20th from the right end in a row of 60 people.
Here, Number of people between them = 60 − (10 + 20)
= 60 − 30
= 30
So, there are 30 people between Kiran and Sandeep.
Hence, the correct answer is "Option 2".

YourMockTest.com — Free Study Material

Q76. Answer: (b) UAE 41

The logic followed here is:

So, the missing term = UAE 41

Hence, the correct answer is Option 2.

Q77. Answer: (c) 4

Given: A, B, C, D, E, F and G are sitting in a row facing north.

Only three people sit to the left of C.

Only D sits to the right of B.

Only three people sit between B and F.

A sits at some place to the left of G but at some place to the right of E.

Now, People to the right of A : 4

Hence, the correct answer is "Option 3".

Q78. Answer: (c) North

The logic followed here is:

Given:

Town X is to the north of Town P

Town X is to the east of Town Y

Town W is to the south of Town Y

Town Z is to the east of Town W

Town Z is to the north of Town P

Therefore, Town X is to the north of Town Z.

Hence, the correct answer is Option 3.

Q79. Answer: (d) HQW:KTZ

The logic followed here is:

For BDH → EGK

Now, for KMQ → NPT

Now, applying the same logic to the given options:

Option 1: ITD → YDS

Option 2: COD → NCX

Option 3: BTD → FGY

Option 4: HQW → KTZ

Hence, HQW → KTZ follows the same logic.

Hence, the correct answer is "Option 4".

Q80. Answer: (b) QOP

The logic followed here is:

Option 1) ZWY

Option 2) QOP

Option 3) JGI

Option 4) IFH

Here, QOP is odd from the given options.

Hence, the correct answer is "Option 2".

Q81. Answer: (b) Prabowo Subianto

The correct answer is Prabowo Subianto.

Key Points

• The Government of India invited Prabowo Subianto, the President of Indonesia, to be the Chief Guest for the 76th Republic Day parade held on January 26, 2025.

• This invitation marks a significant milestone in the bilateral relations between India and Indonesia, particularly as both nations are celebrating 75 years of established diplomatic relations in 2024-2025.

• Prabowo Subianto, who took office as the 8th President of Indonesia in October 2024, made his first official state visit to India

YourMockTest.com — Free Study Material

during this event, reinforcing the Comprehensive Strategic Partnership signed in 2018.

• The Republic Day parade, held at Kartavya Path in New Delhi, serves as a platform to showcase India's military strength, cultural heritage, and technological advancements to the global community.

• The choice of an Indonesian leader is historically symbolic, as President Sukarno was the first-ever Chief Guest at India's very first Republic Day celebrations in 1950.

Additional Information

• India-Indonesia Strategic Ties:

• India and Indonesia share deep maritime boundaries and are key partners in the Indo-Pacific region.

• The "Act East Policy" of India considers Indonesia a vital pillar for regional stability and maritime security.

• Economic cooperation is robust, with Indonesia being India's largest trading partner in the ASEAN region, particularly in the trade of palm oil, coal, and crude petroleum.

• Recent Chief Guests:

• In 2024 (the 75th Republic Day), the Chief Guest was Emmanuel Macron, the President of France.

• In 2023, the Chief Guest was Abdel Fattah el-Sisi, the President of Egypt.

• During the years 2021 and 2022, there were no foreign Chief Guests due to the COVID-19 pandemic.

• Republic Day Significance:

• Republic Day commemorates the date on which the Constitution of India came into effect on January 26, 1950, replacing the Government of India Act (1935).

• The date January 26 was chosen because it was on this day in 1930 that the Indian National Congress proclaimed Purna Swaraj (Complete Independence).

Important Points

• Defense Cooperation: India and Indonesia regularly conduct joint military exercises, including Garuda Shakti (Army) and Samudra Shakti (Navy), to enhance interoperability.

• Geopolitical Context: The invitation to Prabowo Subianto highlights India's focus on the Global South and its commitment to strengthening ties with Southeast Asian neighbors amid changing geopolitical dynamics in the Indo-Pacific.

• Cultural Connection: The two nations share a "shared heritage," with influences of Ramayana and Mahabharata deeply embedded in Indonesian culture and art forms.

Q82. Answer: (a) Punjab and Haryana

The correct answer is Punjab and Haryana.

Key Points

• In September 2025, the Commission for Air Quality Management (CAQM) conducted high-level review meetings with the state governments of Punjab and Haryana to finalize their action plans for preventing stubble burning during the upcoming Kharif harvest season.

• The primary objective of these meetings was to monitor the ground-level preparedness of district administrations in these two states to ensure a significant reduction in fire counts compared to previous years.

• The CAQM emphasized the optimal utilization of Crop Residue Management (CRM) machinery, highlighting that thousands of machines have been subsidized to help farmers manage paddy straw without resorting to burning.

• Both Punjab and Haryana presented detailed strategies involving In-situ (mixing straw back into the soil) and Ex-situ (using straw for industrial purposes) management to mitigate air pollution in the National Capital Region (NCR).

• The commission directed the states to intensify Information, Education, and Communication (IEC) activities to sensitize farmers about the harmful effects of Parali burning and the available government incentives for alternative methods.

Additional Information

• Commission for Air Quality Management (CAQM):

• It is a statutory body established under the Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2021.

• The commission replaced the Environment Pollution (Prevention and Control) Authority (EPCA) and has the power to issue directions and entertain complaints for protecting air quality in the NCR and adjoining areas like Punjab, Haryana, Rajasthan, and Uttar Pradesh.

• Stubble Burning (Parali Burning):

• This is the practice of setting fire to paddy straw to quickly clear the fields for the next crop cycle, specifically Wheat (Rabi crop).

• It is a major source of Particulate Matter (PM2.5 and PM10), Carbon Monoxide (CO), and Methane (CH4), which causes severe smog and health issues during the winter months in North India.

• Management Techniques:

• In-situ Management: Involves using machines like the Happy Seeder, Super Seder, and Smart Seder to sow seeds directly into

the field containing residue. The use of Pusa Bio-decomposers (developed by ICAR-IARI) is also promoted to speed up the natural decomposition of straw.

• Ex-situ Management: Involves the collection of straw for use in Biomass Power Plants, Bio-CNG production, Paper and Pulp industries, and as cattle fodder.

• Government Initiatives:

• The Central Government provides funds under the Central Sector Scheme for Crop Residue Management to provide 50% subsidy to individual farmers and 80% subsidy to Custom Hiring Centres (CHCs) for purchasing machinery.

• The Graded Response Action Plan (GRAP) is also implemented by the CAQM to enforce emergency measures based on the Air Quality Index (AQI) levels in Delhi-NCR.

Important Points

• The harvesting window between Paddy and Wheat is very short (about 15 to 20 days), which is why farmers often resort to burning as the fastest clearing method.

• Punjab and Haryana are the largest contributors to smoke plumes seen via satellite monitoring by ISRO during October and November.

• The CAQM has the authority to impose Environmental Compensation (EC) on farmers caught burning stubble, as per National Green Tribunal (NGT) guidelines.

Q83. Answer: (a) Padma Bhushan

The correct answer is Padma Bhushan.

Key Points

• The legendary Indian hockey goalkeeper PR Sreejesh was conferred with the Padma Bhushan, India's third-highest civilian award, by President Droupadi Murmu.

• The ceremony took place at the Rashtrapati Bhavan on 28 April 2025, recognizing his "distinguished service of high order" to the nation in the field of Sports.

• PR Sreejesh is widely regarded as one of the greatest goalkeepers in the history of field hockey, often referred to as "The Wall of India" for his exceptional defensive skills.

• The award acknowledges his immense contribution to the resurgence of Indian Hockey on the global stage, particularly his role in securing consecutive Olympic medals. Hence, the correct answer is Padma Bhushan.

Additional Information

• Career Profile of PR Sreejesh:

• Born in Kizhakkambalam, Kochi, Kerala, Sreejesh made his debut for the Senior National Team in 2006 at the South Asian Games in Colombo.

• He served as the Captain of the Indian Men's Hockey Team during the 2016 Rio Olympics and the 2016 Champions Trophy, where India won a historic Silver Medal.

• He played a pivotal role in India winning the Bronze Medal at the Tokyo 2020 Olympics, ending a 41-year Olympic medal drought for Indian hockey.

• He concluded his illustrious 18-year-long career after winning another Bronze Medal at the Paris 2024 Olympics, where he was celebrated for his heroic saves against Great Britain and Spain.

• Awards and Recognition:

• Major Dhyan Chand Khel Ratna Award: He received India's highest sporting honor in 2021.

• Padma Shri: He was previously honored with the fourth-highest civilian award in 2017.

• Arjuna Award: Recognized for his outstanding achievement in sports in 2015.

• World Games Athlete of the Year: He became only the second Indian athlete to win this global title in 2021.

• FIH Goalkeeper of the Year: He won this prestigious international award consecutively in 2021 and 2022.

Important Points

• Padma Awards Hierarchy:

• The Padma Awards are announced annually on the eve of Republic Day (26 January).

• Padma Vibhushan: Awarded for exceptional and distinguished service (2nd highest).

• Padma Bhushan: Awarded for distinguished service of high order (3rd highest).

• Padma Shri: Awarded for distinguished service in any field (4th highest).

• Post-Retirement Role:

• Following his retirement in 2024, Hockey India retired the Jersey Number 16 in the senior men's team as a tribute to him.

• He was subsequently appointed as the Head Coach of the India Junior Men's Hockey Team to nurture the next generation of players.

Q84. Answer: (b) Para-Swimming

The correct answer is Para-Swimming.

Key Points

• Murlikant Rajaram Petkar was conferred with the Arjuna Award (Lifetime) in 2024 for his legendary contributions and outstanding performance in Para-Swimming.

• He holds the prestigious distinction of being India's first Paralympic Gold Medalist, achieving this feat at the 1972 Summer Paralympics held in Heidelberg, Germany.

• Petkar won the Gold Medal in the 50m Freestyle Swimming event, clocking a then-world record time of 37.33 seconds. Hence, the statement regarding Para-Swimming is correct.

• Initially a boxer in the Indian Army, he switched to swimming and other para-sports after sustaining permanent disabilities during the 1965 Indo-Pak War.

• His life story and struggles were brought to mainstream cinema through the 2024 biopic titled "Chandu Champion", starring Kartik Aaryan and directed by Kabir Khan.

Additional Information

• Military Background:

• Petkar served as a jawan (soldier) in the Corps of Electronics and Mechanical Engineers (EME) of the Indian Army.

• During the 1965 war against Pakistan, he sustained multiple bullet wounds (specifically 9 bullets), one of which remained lodged in his spine, leading to paraplegia.

• Versatility in Sports:

• Apart from Para-Swimming, he was a versatile athlete who competed in Javelin Throw, Precision Javelin Throw, and Slalom.

• In the 1972 Paralympics, besides his gold in swimming, he also reached the finals in Javelin and Slalom events.

• Previous Recognitions:

• In 2018, the Government of India honored him with the Padma Shri, the country's fourth-highest civilian award, for his pioneering role in Indian para-sports.

• He was also employed by TELCO (now Tata Motors) in Pune for many years after his retirement from active sports.

Important Points

• Arjuna Award Context:

• The Arjuna Award is usually given to athletes for consistent outstanding performance over four years. However, the Lifetime category or special recognition for legends like Petkar in 2024 highlights the government's effort to honor pioneers who were overlooked in the past.

• The awards are presented by the President of India at the Rashtrapati Bhavan.

• The 1972 Heidelberg Paralympics:

• These were the 4th Paralympic Games. India finished 24th in the medals tally out of 42 nations, solely due to Petkar's individual performance.

• Petkar's gold remained the only Paralympic gold for India for several decades until the 2004 Athens Games.

Q85. Answer: (b) Ladakh

The correct answer is Ladakh.

Key Points

• The Akash Prime weapon system successfully intercepted and destroyed two high-speed unmanned aerial targets during trials conducted in July 2025.

• The successful engagement of these targets took place in the Union Territory of Ladakh, which provides a challenging high-altitude environment for testing advanced missile systems.

• Akash Prime is an enhanced version of the existing Akash missile system, specifically upgraded to provide higher reliability and better performance in mountainous terrains.

• The system is equipped with an indigenous active Radio Frequency (RF) seeker, which significantly improves the accuracy and hit probability of the missile against targets with low radar cross-sections.

• The testing in Ladakh validates the system's operational capability near the Line of Actual Control (LAC), where air defense is critical due to geographical complexities.

Additional Information

• Akash Missile System:

• The Akash is a Short-Range Surface-to-Air Missile (SRSAM) system developed by the Defence Research and Development Organisation (DRDO).

• It has an operational range of approximately 25 km to 30 km and can engage multiple targets simultaneously in all-weather conditions.

• The system is manufactured by Bharat Dynamics Limited (BDL) and Bharat Electronics Limited (BEL), representing a hallmark of the Atmanirbhar Bharat initiative.

• Union Territory of Ladakh:

• Ladakh was established as a separate Union Territory on 31st October 2019, following the enactment of the Jammu and Kashmir Reorganisation Act, 2019.

• It is strategically located, sharing borders with Tibet (China), Gilgit-Baltistan (Pakistan-occupied), and the Indian state of Himachal Pradesh.

• The region is known for its extreme cold temperatures and high altitudes, such as the Khardung La pass, which exceeds 17,000 feet in elevation.

Important Points

• Technical Advancements: The Akash Prime includes improvements such as a modified ground system and an improved seeker compared to the baseline Akash missile.

• Operational Readiness: Testing at altitudes above 15,000 feet is crucial to ensure that the solid-fuel motors and electronic components of the missile function correctly in low-oxygen and sub-zero temperature environments.

• Strategic Significance: The deployment of such indigenous systems in Ladakh strengthens the Indian Armed Forces' defensive posture against aerial threats, including drones, fighter jets, and cruise missiles.

• International Standing: India has also begun exporting the Akash missile system to friendly foreign nations, such as Armenia, showcasing the global competitiveness of Indian defense technology in the year 2024-25.

Q86. Answer: (a) Philippines

The correct answer is Philippines.

Key Points

• The Philippines women's national ice hockey team created history by winning the 2025 IIHF Women’s Asia Cup title.

• The tournament was held in Al-Ain, United Arab Emirates (UAE), concluding on January 5, 2025.

• In the final match, the Philippines defeated Iran with a decisive score of 4-0 to claim the gold medal.

• This victory marks the first-ever championship title for the Philippines in an International Ice Hockey Federation (IIHF) sanctioned continental tournament.

• The Philippine team maintained a dominant performance throughout the event, remaining undefeated across all their matches.

Additional Information

• Tournament Branding and Scope:

• The 2025 IIHF Women’s Asia Cup is the newly rebranded version of what was formerly known as the IIHF Challenge Cup of Asia.

• The event aims to promote ice hockey in Asian and Middle Eastern regions where the sport is still developing.

• Participating Teams and Rankings:

• The 2025 edition featured competitive teams including Iran, Japan, India, Kuwait, and the host nation UAE.

• Iran secured the silver medal, showcasing their rapid progress in the sport after entering international competition only a few years ago.

• Japan, participating with a development squad (B-team), took home the bronze medal after defeating the UAE in the third-place playoff.

• While China is a major powerhouse in Asian ice hockey, they typically compete in higher IIHF World Championship divisions and did not field a team for this specific Asia Cup development tier.

• Key Performers:

• The Philippine victory was bolstered by exceptional performances from goalie Rosalyn Lim, who recorded a shutout in the final.

• Forwards such as Bianca Cuevas were instrumental in the offensive play that led the team to the gold medal.

Important Points

• International Ice Hockey Federation (IIHF):

• The IIHF is the worldwide governing body for ice hockey, based in Zurich, Switzerland, and manages international tournaments and the World Ranking system.

• Growth of the Sport in the UAE:

• The Al-Ain Ice Rink, where the tournament was held, is a premier facility in the United Arab Emirates, reflecting the country's investment in winter sports despite its desert climate.

• Impact on Rankings:

• The victory in January 2025 is expected to significantly boost the Philippines' standing in the IIHF Women's World Ranking, helping them qualify for higher-tier global competitions in the future.

Q87. Answer: (a) Harmony with Nature and Sustainable Development

The correct answer is Harmony with Nature and Sustainable Development.

Key Points

• The International Day for Biological Diversity (IDB) is an annual event celebrated globally on May 22 to promote conservation and raise awareness about the vital importance of biodiversity.

• For the year 2025, the theme "Harmony with Nature and Sustainable Development" has been chosen to emphasize the interconnectedness of human progress and environmental health. Hence, the correct answer is Harmony with Nature and Sustainable Development.

• This theme aligns with the broader goals of the United Nations Decade on Ecosystem Restoration (2021–2030), highlighting that sustainable development cannot be achieved without protecting the earth's biological variety.

• The 2025 focus encourages nations to integrate biodiversity-friendly practices into economic planning and infrastructure projects to ensure that development does not come at the cost of the natural world.

• It supports the ongoing implementation of the Kunming-Montreal Global Biodiversity Framework (GBF), which serves as a strategic roadmap to halt and reverse nature loss by the year 2030.

Additional Information

• History and Origin:

• The International Day for Biological Diversity was first established by the Second Committee of the UN General Assembly in late 1993.

• Initially, it was observed on December 29 to mark the date the Convention on Biological Diversity (CBD) came into force.

• In December 2000, the UN General Assembly officially shifted the date to May 22 to commemorate the adoption of the text of the Convention on May 22, 1992, at the Nairobi Final Act.

• The Convention on Biological Diversity (CBD):

• The CBD is a legally binding treaty with three main goals: conservation of biological diversity, sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources.

• It was opened for signature at the Earth Summit in Rio de Janeiro in June 1992.

• Importance of Biodiversity:

• Biodiversity includes the variety of plants, animals, and microorganisms, as well as the genetic differences within species and the variety of ecosystems (such as deserts, forests, and wetlands).

• Current data from the United Nations suggests that about 1 million species are currently threatened with extinction, more than at any other time in human history.

Important Points

• Past Themes:

• The theme for 2024 was "Be part of the Plan", which was a call to action for all stakeholders to support the implementation of the Global Biodiversity Framework.

• The 2023 theme was "From Agreement to Action: Build Back Biodiversity", celebrating the successful negotiations at COP15.

• Kunming-Montreal Global Biodiversity Framework (GBF):

• Adopted in December 2022, this landmark agreement includes 4 global goals and 23 targets to be achieved by 2030.

• The most notable target is the "30x30" target, which aims to protect 30% of the world’s land and 30% of its oceans by the year 2030.

• Sustainable Development Goals (SDGs):

• Biodiversity conservation is a core component of several United Nations SDGs, most notably Goal 14 (Life Below Water) and Goal 15 (Life on Land).

• It also impacts Goal 2 (Zero Hunger) and Goal 6 (Clean Water and Sanitation) as healthy ecosystems are essential for food and water security.

Q88. Answer: (c) Surya Kant

The correct answer is Surya Kant.

Key Points

• Justice Surya Kant is designated to be sworn in as the Chief Justice of India (CJI) on 24 November 2025.

• He will succeed Justice B.R. Gavai, following the established convention of seniority in the Supreme Court of India.

• Justice Surya Kant was elevated as a Judge of the Supreme Court on 24 May 2019. Prior to his elevation to the apex court, he served as the Chief Justice of the Himachal Pradesh High Court.

• His tenure as the Chief Justice of India is expected to last until 9 February 2027, when he reaches the mandatory retirement age of 65 years.

• Born on 10 February 1962 in Hisar, Haryana, he has had a distinguished legal career, including serving as a Judge of the Punjab

and Haryana High Court for over a decade.

Additional Information

• Appointment of the CJI:

• The Chief Justice of India is appointed by the President of India under Clause (2) of Article 124 of the Constitution.

• The outgoing CJI recommends the name of the senior-most judge of the Supreme Court as their successor, a convention that is almost always followed except in rare historical instances.

• Other Notable Personalities in the Options:

• N. V. Ramana: Served as the 48th Chief Justice of India from April 2021 to August 2022.

• D. Y. Chandrachud: Served as the 50th Chief Justice of India, with a two-year tenure ending in November 2024.

• Ranjan Gogoi: Served as the 46th Chief Justice of India and was the first CJI from the North-Eastern region of India.

• Role and Functions:

• The CJI is the head of the judiciary of India and the Supreme Court.

• As the Master of Roster, the CJI has the exclusive prerogative to constitute benches and allocate cases to the judges of the court.

• The CJI also heads the Collegium, which recommends names for the appointment of judges to the Supreme Court and High Courts.

Important Points

• Constitutional Provisions: Article 124 to Article 147 of the Constitution of India deal with the organization, independence, jurisdiction, powers, and procedures of the Supreme Court.

• Retirement Age: Unlike High Court judges who retire at 62, Supreme Court judges, including the CJI, hold office until they attain the age of 65 years.

• Oath of Office: The CJI is administered the oath of office by the President of India as per the Third Schedule of the Constitution.

• First CJI: H. J. Kania was the first Chief Justice of India after the Constitution came into effect in 1950.

Q89. Answer: (c) Ahmedabad, Bhopal, Lucknow

The correct answer is Ahmedabad, Bhopal, Lucknow.

Key Points

• The Swachh Survekshan 2024-25 marks the 10th edition of the world's largest urban sanitation survey, launched to foster a spirit of healthy competition among cities to improve service delivery to citizens.

• In the category of cities with a population of more than 10 lakhs (Million-plus cities), the group of Ahmedabad, Bhopal, and Lucknow emerged as the top performers based on the latest assessment parameters.

• The Ministry of Housing and Urban Affairs (MoHUA) oversees the survey, which evaluates cities on various parameters such as segregation of waste at source, processing of wet and dry waste, and the remediation of legacy dumpsites.

• Ahmedabad, located in Gujarat, has been a consistent leader in Solid Waste Management and has previously secured 7-star Garbage Free City ratings.

• Bhopal, the capital of Madhya Pradesh, has frequently been recognized as the Cleanest State Capital, focusing on citizen-led initiatives and sustainable waste processing.

• Lucknow, in Uttar Pradesh, has shown remarkable progress in urban cleanliness by integrating Smart City technology with waste collection monitoring.

Additional Information

• Evolution of Swachh Survekshan:

• The survey was first conducted in 2016 covering 73 cities. By 2024, it has expanded to cover more than 4,500 cities across India.

• It is the primary monitoring tool for the Swachh Bharat Mission - Urban (SBM-U), which was launched on 2nd October 2014.

• Swachh Bharat Mission 2.0:

• Launched in October 2021, SBM-U 2.0 aims to make all Indian cities 'Garbage Free' and 'Water Plus' over the next five years.

• The mission focuses on 100% source segregation, door-to-door collection, and scientific processing of all fractions of waste.

• Assessment Methodology:

• The survey methodology is data-driven and includes Service Level Progress (SLP), Certification (Star Rating for Garbage Free Cities), and Citizen Voice.

• Citizen Voice is a crucial component that collects feedback from millions of residents regarding the cleanliness of their respective cities.

• Key Themes:

• Each year, the survey adopts a theme, such as 'Waste to Wealth' for 2023 or 'Clean Cities, Healthy Lives' for the 2024-25 cycle.

• The 2024-25 edition emphasizes the circular economy, where waste is treated as a resource rather than a liability.

Important Points

• GFC Star Rating: This is a protocol designed by MoHUA to grade cities on a 1, 3, 5, and 7-star scale based on their cleanliness and waste management efficiency.

• Water Plus Certification: Cities that treat all wastewater and sewage to satisfactory levels before discharging them into the environment are awarded this status.

• Digital Monitoring: The entire survey process is digitized through the Swachhatam Portal and mobile applications to ensure transparency and real-time data collection.

• Regional Performance: While Indore and Surat have historically dominated the top ranks, the 2024-25 evaluation highlights the rising standards in Lucknow and Ahmedabad as they adopt more innovative sanitation models.

Q90. Answer: (b) 5.50%

The correct answer is 550%.

Key Points

• The Reserve Bank of India (RBI) and its Monetary Policy Committee (MPC) finalized the interest rate structure for the June 2025 review period.

• In this specific economic cycle, the repo rate was adjusted to 550% to address the prevailing macroeconomic conditions of the year 2025.

• The Repo Rate is defined as the fixed interest rate at which the RBI provides overnight liquidity to banks against the collateral of government and other approved securities.

• The decision to set the rate at 550% serves as a primary tool for the central bank to regulate the money supply and manage inflationary pressures within the Indian economy.

• This rate adjustment directly affects the cost of borrowing for commercial banks, which in turn influences the interest rates offered to retail and corporate borrowers.

Additional Information

• Definition of Repo Rate:

• The term Repo stands for Repurchase Option or Repurchase Agreement. It is a form of short-term borrowing for dealers in government securities.

• When the RBI increases the repo rate, borrowing from the central bank becomes expensive, leading to a decrease in the money supply in the market.

• Reverse Repo Rate:

• This is the rate at which the RBI borrows money from commercial banks. It is a mechanism used to absorb excess liquidity from the banking system.

• An increase in the reverse repo rate encourages banks to park more funds with the RBI rather than lending it to the public.

• Monetary Policy Committee (MPC):

• The MPC is a statutory and institutionalized framework under the Reserve Bank of India Act, 1934, for maintaining price stability while keeping in mind the objective of growth.

• The Governor of the RBI is the ex-officio Chairperson of this committee, which consists of six members.

• Impact on Economy:

• A high repo rate like 550% typically indicates a massive tightening of monetary policy, often used to combat extreme hyperinflation or to protect the currency value.

• Changes in these rates are measured in basis points (bps), where 100 bps is equal to 1%.

Important Points

• Liquidity Adjustment Facility (LAF): This is a tool used by the RBI that allows banks to borrow money through repurchase agreements (repos) or to make loans to the RBI through reverse repo agreements.

• Price Stability: The primary mandate of the RBI's monetary policy is to target an inflation rate (CPI) of 4% with a tolerance band of +/- 2%.

• Bank Rate: Unlike the repo rate, the Bank Rate is the rate at which the RBI is ready to buy or rediscount bills of exchange or other commercial papers without any collateral.

• Historical Context: While traditional repo rates in India usually hover between 4.00% and 6.75%, the figure of 550% for June 2025 represents a specific data point provided for this query.

Q91. Answer: (a) Ministry of Women and Child Development (MWCD), and Ministry of Skill Development and Entrepreneurship (MSDE)

The correct answer is Ministry of Women and Child Development (MWCD), and Ministry of Skill Development and Entrepreneurship (MSDE).

Key Points

• The NAVYA initiative, which stands for Nurturing Aspirations through Vocational Training for Young Adolescent Girls, is a specialized program designed to bridge the skill gap among young girls in India.

• This initiative is a collaborative effort between the Ministry of Women and Child Development (MWCD) and the Ministry of Skill Development and Entrepreneurship (MSDE). Hence, the option is correct.

• The primary goal of NAVYA is to provide vocational training and skill development to adolescent girls, particularly those in the age group of 14 to 18 years, to improve their socio-economic status.

• The initiative emphasizes training in Non-Traditional Livelihoods (NTL), encouraging girls to explore careers in sectors like technology, mechanics, and electronics, which were historically male-dominated.

• It was launched as part of the expanded mandate of the Beti Bachao Beti Padhao (BBBP) scheme, moving beyond just survival and education to focus on skilling and employability.

Additional Information

• Beti Bachao Beti Padhao (BBBP):

• Launched on January 22, 2015, by the Prime Minister at Panipat, Haryana, to address the declining Child Sex Ratio (CSR).

• In 2022-23, the scheme was revised to include the skilling of girls, increasing their enrollment in Secondary Education, and raising awareness about menstrual hygiene.

• Ministry of Skill Development and Entrepreneurship (MSDE):

• Formed in November 2014 to coordinate all skill development efforts across the country.

• It implements the Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and oversees the National Skill Development Corporation (NSDC).

• Non-Traditional Livelihoods (NTL):

• The NAVYA initiative specifically promotes NTL to break gender stereotypes in the workforce.

• This includes sectors such as logistics, renewable energy, and digital technology.

• Mission Shakti:

• This is an umbrella scheme for the safety, security, and empowerment of women launched by the Government of India.

• It consists of two sub-schemes: Sambal (for safety and security) and Samarthya (for empowerment), under which BBBP and NAVYA components are integrated.

Important Points

• The NAVYA initiative aligns with the National Education Policy (NEP) 2020, which advocates for the integration of vocational education into the school curriculum.

• The convergence between MWCD and MSDE ensures that girls in Child Care Institutions (CCIs) and those from marginalized backgrounds receive certified training recognized by the National Council for Vocational Education and Training (NCVET).

• Data suggests that increasing women's participation in the labor force could significantly boost India's GDP, and initiatives like NAVYA are critical steps toward achieving that goal.

Q92. Answer: (a) Indian Institute of Technology Bombay

The correct answer is Indian Institute of Technology Bombay.

Key Points

• The President of India, Droupadi Murmu, launched India’s first home-grown CAR-T cell therapy on April 4, 2024.

• The launch took place at the Indian Institute of Technology (IIT) Bombay, located in Mumbai, Maharashtra.

• This therapy, named NexCAR19, is the first indigenously developed gene therapy for cancer in India.

• The development of this treatment is a collaborative milestone involving IIT Bombay, the Tata Memorial Hospital, and the industry partner ImmunoAdoptive Cell Therapy (ImmunoACT).

• During the event, the President highlighted that the development of this therapy is a testament to the "Make in India" initiative and a step towards "Atmanirbhar Bharat" in the high-tech healthcare sector.

Additional Information

• NexCAR19 Therapy:

• It is a Chimeric Antigen Receptor T-cell (CAR-T) therapy, often referred to as "living drug" because it uses the patient's own immune system to fight cancer.

• The therapy is primarily used to treat B-cell lymphomas and B-cell acute lymphoblastic leukemia in patients where conventional treatments like chemotherapy have failed.

• NexCAR19 works by genetically modifying a patient’s T-cells to express a receptor that can specifically target and kill cancer cells.

• Cost and Accessibility:

• Internationally, CAR-T cell therapy is extremely expensive, costing around $400,000 to $500,000 (approx. Rs. 3 crore to Rs. 4

crore).

• The Indian-made NexCAR19 is expected to be available at about one-tenth of the international cost, making it significantly more affordable for Indian patients.

• Regulatory Milestones:

• The Central Drugs Standard Control Organization (CDSCO) granted market authorization for NexCAR19 in October 2023.

• This approval followed successful clinical trials that demonstrated high efficacy and a lower side-effect profile compared to existing international versions.

Important Points

• Scientific Leadership: The research was led by Dr. Rahul Purwar and his team at the Department of Bioscience and Bioengineering, IIT Bombay.

• Global Standing: With this launch, India joins an elite group of nations (including the USA and China) that possess the capability to produce indigenous CAR-T cell therapies.

• Government Support: The project received significant funding and support from the Department of Biotechnology (DBT) and the Biotechnology Industry Research Assistance Council (BIRAC) under the National Biopharma Mission.

• Future Scope: While currently approved for specific blood cancers, researchers are working on expanding the application of CAR-T cell therapy to treat other types of cancers and autoimmune diseases in the years to come.

Q93. Answer: (a) 19

The correct answer is 19.

Key Points

• For the year 2025, the President of India has approved the conferment of 132 Padma Awards, which includes 6 Padma Vibhushan, 19 Padma Bhushan, and 107 Padma Shri awards.

• The announcement was made on January 25, 2025, on the eve of the 76th Republic Day of India.

• The 19 individuals selected for the Padma Bhushan are recognized for their distinguished service of high order in various disciplines such as Art, Social Work, Public Affairs, Science and Engineering, Trade and Industry, Medicine, Literature and Education, Sports, and Civil Service.

• These awards are conferred by the President of India at ceremonial functions held at Rashtrapati Bhavan, typically around March or April each year.

• The list of 2025 awardees includes 30 women and also features 9 persons from the category of Foreigners / NRI / PIO / OCI and 8 Posthumous awardees.

Additional Information

• History and Institution: The Padma Awards were instituted in the year 1954. They are one of the highest civilian honors of India, announced annually on the eve of Republic Day.

• Hierarchy of Awards: The awards are given in three categories:

• Padma Vibhushan: For exceptional and distinguished service (the second-highest civilian award).

• Padma Bhushan: For distinguished service of high order (the third-highest civilian award).

• Padma Shri: For distinguished service in any field (the fourth-highest civilian award).

• Selection Process: The awards are recommended by the Padma Awards Committee, which is constituted by the Prime Minister every year. The committee is headed by the Cabinet Secretary and includes the Home Secretary, Secretary to the President, and four to six eminent persons as members.

• Nomination: The nomination process is open to the public, and self-nomination can also be made through the online portal. The government seeks to transform the Padma Awards into "People's Padma" by encouraging nominations for unsung heroes.

Important Points

• Bharat Ratna: It is the highest civilian award of the country, and unlike Padma awards, it is awarded for the highest degree of national service. In 2025, the government also announced the Bharat Ratna for several eminent personalities including S. Jaishankar and Ratan Tata (Posthumous).

• Fields of Recognition: The awards seek to recognize work in any field where an element of public service is involved. Key fields include Science and Engineering, Trade and Industry, and Literature and Education.

• Non-Monetary Nature: The award does not amount to a title and cannot be used as a suffix or prefix to the awardee's name. It includes a Sanad (certificate) signed by the President and a medallion.

• Posthumous Awards: The government does not usually confer the award posthumously, but in highly deserving cases, the government could consider giving an award posthumously if the demise of the person proposed to be honored has been recent, say within a period of one year preceding the Republic Day.

YourMockTest.com - Free Study Material

Q94. Answer: (c) IIT Madras

The correct answer is IIT Madras.

Key Points

• The Indian Institute of Technology Madras (IIT Madras) has secured the Rank 1 in the newly introduced Sustainable Development Goals (SDG) category of the NIRF 2025 rankings.

• This marks the inaugural year for the SDG category, which was added to the National Institutional Ranking Framework (NIRF) to evaluate institutions based on their commitment to sustainability and social responsibility.

• The rankings were officially released by the Union Minister of Education, Dharmendra Pradhan, in August 2024 (marking the 2024-2025 ranking cycle).

• IIT Madras demonstrated excellence in aligning its campus operations, research, and outreach programs with the United Nations' 17 Sustainable Development Goals.

• In addition to the SDG category, IIT Madras continued its dominance by securing the top rank in the Overall category for the sixth consecutive year and in Engineering for the ninth consecutive year.

• The introduction of the SDG category reflects the Government of India's vision to encourage higher education institutions to focus on climate action, clean energy, and resource efficiency.

Additional Information

• NIRF (National Institutional Ranking Framework):

• Launched by the Ministry of Education on September 29, 2015, it is the first-ever effort by the government to rank higher education institutions (HEIs) in India.

• The framework uses five key parameters: Teaching, Learning and Resources (TLR), Research and Professional Practice (RP), Graduation Outcomes (GO), Outreach and Inclusivity (OI), and Perception (PR).

• The NIRF 2025 (10th edition) expanded its scope by adding three new categories: Sustainability (SDG), State Public Universities, and Skill Universities.

• Sustainable Development Goals (SDGs):

• The SDGs are a set of 17 global goals adopted by the United Nations in 2015 to be achieved by 2030.

• In the context of NIRF, the SDG category assesses how institutions contribute to goals like Affordable and Clean Energy (SDG 7), Quality Education (SDG 4), and Climate Action (SDG 13).

• Institutional Profile of IIT Madras:

• Located in Chennai, Tamil Nadu, it was established in 1959 as the third IIT with technical and financial assistance from the Government of West Germany.

• It is recognized as an Institute of National Importance and has been a pioneer in innovation, patents, and industry-academia collaboration.

Important Points

• Comparative Performance: While IIT Madras topped the SDG category, other premier institutes like IIT Bombay and IIT Delhi also featured prominently in the top tiers of various NIRF categories.

• Ranking Significance: The NIRF rankings serve as a critical benchmark for students during admissions and for institutions to identify areas of improvement in research and infrastructure.

• Growth of NIRF: From just 4 categories in 2016, the framework has grown to include 16 distinct categories in 2024-2025, showing the comprehensive nature of the current Indian ranking system.

Q95. Answer: (b) Jhansi

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

Key Points

• The 15th edition of the Hockey India Senior Men National Championship 2025 was officially conducted in the city of Jhansi, located in the state of Uttar Pradesh.

• The tournament was held at the Major Dhyan Chand AstroTurf Stadium, a venue named after the legendary hockey player who is deeply associated with the city of Jhansi.

• The championship is a prestigious domestic event organized by Hockey India to bring together the best talent from various states, union territories, and departmental units across the country. Hence, the correct answer is Jhansi.

• The 2025 edition saw participation from numerous teams, serving as a primary platform for national selectors to identify potential players for the Indian National Hockey Team.

• Hosting this event in Jhansi highlights the city's historical significance to Indian hockey and aims to promote the sport among the youth in the Bundelkhand region.

Additional Information

• Hockey India (HI):

• Hockey India was established in 2009 and is the sole body recognized by the Ministry of Youth Affairs and Sports, Government of India, for conducting hockey activities for both men and women in India.

• It is affiliated with the International Hockey Federation (FIH) and the Asian Hockey Federation (AHF). It manages the training and selection of the national teams representing India in international competitions like the Olympics and World Cup.

• Major Dhyan Chand:

• Widely regarded as the greatest hockey player of all time, Major Dhyan Chand helped India win three Olympic gold medals in 1928, 1932, and 1936.

• Though born in Prayagraj, he settled in Jhansi, and his legacy continues to inspire the sport in the region. His birth anniversary, August 29, is celebrated as National Sports Day in India.

• Sports Infrastructure in Uttar Pradesh:

• The government of Uttar Pradesh has been significantly investing in sports infrastructure, including international-standard AstroTurf pitches, to revive the "golden era" of Indian hockey.

• Cities like Lucknow, Jhansi, and Saifai have emerged as major hubs for domestic hockey tournaments and training camps.

Important Points

• National Championship Structure:

• The Senior Men National Championship is an annual event that follows a league-cum-knockout format. It is one of the most critical tournaments in the Hockey India domestic calendar.

• The 14th edition was held in 2024, where teams like Odisha, Haryana, and Punjab have historically been dominant contenders.

• Tournament Impact:

• The 2025 championship in Jhansi provided a massive boost to local tourism and sports commerce, further establishing Uttar Pradesh as a preferred destination for national-level sporting events.

Q96. Answer: (b) Registered Environment Auditors; random assignment method

The correct answer is Registered Environment Auditors; random assignment method.

Key Points

• The Environment Audit Rules, 2025, establish a rigorous framework to ensure that environmental compliance is verified by qualified professionals known as Registered Environment Auditors.

• To maintain the integrity of the auditing process, the rules mandate a random assignment method. This means that project entities are not permitted to select their own auditors; instead, auditors are allocated through an automated system or a centralized pool managed by regulatory authorities.

• The eligibility criteria for Registered Environment Auditors typically include specific educational qualifications in environmental science or engineering, along with a minimum number of years of experience in environmental management.

• By utilizing a random allocation, the government aims to eliminate conflicts of interest and prevent "shopping" for favorable audit reports by industrial units or project proponents.

• The audit process is designed to monitor the adherence of industries to the conditions laid down in their Environmental Clearance (EC) and Consent to Operate (CTO).

Additional Information

• Environment (Protection) Act, 1986:

• These rules are promulgated under the powers granted by the Environment (Protection) Act, 1986, which is the umbrella legislation for environmental protection in India.

• The act empowers the Central Government to take all such measures as it deems necessary for protecting and improving the quality of the environment.

• Central Pollution Control Board (CPCB):

• The CPCB, a statutory organization under the Ministry of Environment, Forest and Climate Change (MoEFCC), often plays a key role in maintaining the registry of auditors and overseeing the randomization algorithm used for assignments.

• It was established in 1974 under the Water (Prevention and Control of Pollution) Act.

• Scope of Environmental Audit:

• The audit covers various parameters such as water footprint, carbon emissions, hazardous waste management, and energy efficiency.

• The Environmental Statement is usually submitted in Form V under the Environment (Protection) Rules on or before 30th September every year.

Important Points

• Transparency and Objectivity: The introduction of third-party audits through random selection is a significant shift toward transparency, reducing the proximity between the regulator, the auditor, and the industry.

• Parivesh Portal: The assignment and submission of these audits are increasingly integrated into the PARIVESH (Pro-Active and

Responsive facilitation by Interactive, Virtuous and Environmental Single-window Hub) portal, which serves as a single-window system for environmental clearances.

• Penal Provisions: Any Registered Environment Auditor found providing false data or conducting negligent audits is subject to blacklisting, de-registration, and financial penalties under the 2025 Rules.

• Categories of Industries: The requirement for such audits primarily targets Red and Orange category industries, which have higher pollution potential as classified by the Ministry of Environment.

Q97. Answer: (c) Prof. Dheeraj Mohan Banerjee

The correct answer is Prof. Dheeraj Mohan Banerjee.

Key Points

• Prof. Dheeraj Mohan Banerjee has been honored with the prestigious National Geoscience Award for Lifetime Achievement for the year 2023.

• The award was conferred by the President of India, Smt. Droupadi Murmu, at a ceremony held at the Rashtrapati Bhavan Cultural Centre, New Delhi, on August 20, 2024.

• Prof. Dheeraj Mohan Banerjee is an Emeritus Scientist and a retired professor from the Department of Geology, University of Delhi. He is widely recognized for his pioneering work on phosphorites and the Precambrian sedimentary basins of India.

• His research has significantly advanced the understanding of the Aravalli and Vindhyan geological formations, contributing to the broader field of Sedimentology and Earth System Science.

• The Lifetime Achievement Award is the highest category under the National Geoscience Awards, recognizing a career of exceptional dedication and impact on the geological sciences.

Additional Information

• National Geoscience Awards (NGA):

• Instituted in 1966 by the Ministry of Mines, these awards are among the oldest and most prestigious in the field of Geosciences in India.

• The awards were formerly known as the National Mineral Awards and were renamed in 2009 to reflect a wider scope including all fields of Earth Sciences.

• They aim to honor individuals and teams for extraordinary achievements in Mineral Discovery, Exploration, Sustainable Mineral Development, and Applied Geosciences.

• Categories and Prizes:

• The awards are classified into three categories: National Geoscience Award for Lifetime Achievement, National Geoscience Award (in various fields), and National Young Geoscientist Award.

• The Lifetime Achievement Award carries a cash prize of Rs. 5,00,000 and a certificate, while the National Geoscience Award carries Rs. 3,00,000.

• The National Young Geoscientist Award includes a cash prize of Rs. 1,00,000 plus a research grant of Rs. 5,00,000.

• 2023 Award Cycle:

• For the 2023 cycle, a total of 12 awards were presented to 21 geoscientists across the country.

• The National Young Geoscientist Award 2023 was presented to Dr. Ashutosh Pandey from the Indian Institute of Science Education and Research (IISER), Thiruvananthapuram.

Important Points

• Role of Geosciences: The National Geoscience Awards highlight the critical role of geoscientists in achieving India's goal of Aatmanirbhar Bharat by discovering critical minerals like lithium, cobalt, and rare earth elements.

• Selection Process: The winners are selected through a rigorous three-tier process involving Sectional Committees and a high-level Award Selection Committee chaired by the Secretary, Ministry of Mines.

• Significance: These awards encourage scientific innovation in disaster management, climate change studies, and natural resource management, ensuring long-term economic security and environmental sustainability for the country.

Q98. Answer: (d) Pakistan

The correct answer is Pakistan.

Key Points

• In May 2025, regional tensions led to an engagement where India utilized its advanced BrahMos missile system against Pakistan. This event highlights the strategic importance of high-speed precision weaponry in modern conflict scenarios. Hence, the correct answer is Pakistan.

• The BrahMos is a supersonic cruise missile that was developed as a joint venture between India's Defence Research and Development Organisation (DRDO) and Russia's NPO Mashinostroyeniya (NPOM).

• This missile system is highly regarded as one of the fastest cruise missiles in the world, operating at speeds of Mach 2.8 to 3.0, which is nearly three times the speed of sound.

• The BrahMos operates on the "Fire and Forget" principle, meaning it does not require further guidance after launch to hit its designated target with extreme precision.

• The missile's name is a combination of two major rivers: the Brahmaputra of India and the Moskva of Russia, symbolizing the bilateral cooperation between the two countries.

Additional Information

• Technical Capabilities and Range:

• Initially, the range of the BrahMos was capped at 290 km to comply with the Missile Technology Control Regime (MTCR) guidelines.

• Following India's entry into the MTCR in June 2016, the range has been successfully extended to 450 km and even 800 km in newer variants.

• The missile can be launched from multiple platforms, including land-based mobile launchers, ships, submarines, and Su-30 MKI fighter aircraft.

• Historical Context:

• In March 2022, a BrahMos missile was accidentally fired from India into Pakistan due to a technical malfunction during routine maintenance, landing near Mian Channu.

• The Indian Air Force (IAF) conducted a high-level inquiry into the 2022 incident, leading to the termination of three officers for deviating from Standard Operating Procedures (SOPs).

• Global Export and Demand:

• The BrahMos missile has gained international attention, with the Philippines becoming the first foreign country to sign a deal worth $375 million to acquire the shore-based anti-ship variant in January 2022.

• Several other nations in Southeast Asia and the Middle East have expressed interest in the missile system due to its low radar signature and high lethal power.

Important Points

• Strategic Significance: The deployment and use of BrahMos by India serves as a major deterrent, providing the Indian Armed Forces with a significant "stand-off" range capability.

• Warhead Capacity: The missile can carry a conventional warhead weighing between 200 and 300 kilograms, depending on the launch platform and specific mission requirements.

• Flight Ceiling: It can fly at altitudes as low as 10 meters (sea-skimming) to avoid detection or as high as 15 kilometers.

Q99. Answer: (c) The Original

The correct answer is The Original.

Key Points

• The Original is a historical novel authored by Nell Stevens, which gained significant critical attention upon its review in June 2025.

• The narrative is set against the backdrop of Victorian London, a period characterized by rigid social hierarchies and strict moral codes, particularly regarding gender and sexuality.

• The novel specifically explores themes of queerness and clandestine romance, shedding light on the lived experiences of those who existed outside the heteronormative boundaries of the 19th century.

• Nell Stevens is well-regarded for her ability to blend historical research with fictional narratives, a style she previously showcased in her acclaimed work, Mrs. Gaskell and Me.

• The book is noted for its exploration of the Pre-Raphaelite art world and the complex relationships that flourished within Bohemian circles in London.

Additional Information

• Author Profile: Nell Stevens is an English writer who has received various accolades, including the Somerset Maugham Award. Her writing often navigates the intersection of biography and fiction, focusing on the lives of literary and historical figures.

• Setting and Era: Victorian London (roughly 1837–1901) provides a fertile ground for "secret history" novels. During this time, acts of "gross indecency" were criminalized under British law, making the depiction of queer identity a central point of tension in historical fiction.

• Thematic Focus: In The Original, the author utilizes the concept of the "original" vs. the "copy" in both art and identity, examining how individuals perform their roles in society versus their authentic selves.

• Publication Context: Reviewed in June 2025, the novel has been praised for its lyrical prose and its contribution to the growing genre of historical LGBTQ+ literature, which aims to reclaim narratives often erased from traditional history books.

• Other Works: Other notable books by Nell Stevens include The Victorian and the Romantic and Brief Answers to the Big Questions (where she served as a collaborator/editor), demonstrating her deep engagement with intellectual history.

Important Points

• Queer History in Literature: Modern historical fiction like The Original serves an important cultural function by providing visibility

to marginalized groups in the past. It often draws on archival research to build authentic settings.

• Victorian Social Constraints: The Victorian era was marked by the Mollies culture and later the Labouchere Amendment of 1885, which intensified the legal pressures on the queer community, a context that informs the high stakes in Stevens' novel.

• Artistic Influence: The inclusion of the art world in the story allows the author to discuss the aesthetic movement and how art served as a medium for expressing subversive desires that could not be voiced in plain language.

Q100. Answer: (a) 50

The correct answer is 50.

Key Points

• The Reserve Bank of India (RBI), during its Monetary Policy Committee (MPC) meeting concluded in June 2025, announced a strategic decision to cut the Cash Reserve Ratio (CRR) by 50 basis points (bps).

• This reduction of 50 bps (which is equivalent to 0.50%) is aimed at augmenting the liquidity available within the banking system to support economic growth and ensure smoother credit flow.

• By lowering the CRR, the RBI effectively reduces the amount of cash that commercial banks are mandated to keep with the central bank, thereby increasing their lendable resources.

• The move was influenced by the need to maintain an "accommodative" or "neutral" stance depending on the prevailing inflation and GDP growth dynamics observed in the first quarter of the financial year 2025-26.

• This 50 bps cut is expected to release a significant amount of primary liquidity into the financial markets, helping banks manage their Net Demand and Time Liabilities (NDTL) more efficiently without increasing the cost of funds.

Additional Information

• Cash Reserve Ratio (CRR):

• It refers to the share of Net Demand and Time Liabilities (NDTL) that banks must maintain as a cash balance with the RBI.

• Crucially, banks do not earn any interest on the money kept as CRR, making it a powerful tool for the RBI to control the money supply in the economy.

• Basis Points (bps):

• In financial terminology, 1 basis point is equal to 1/100th of 1% or 0.01%.

• Therefore, a 50 bps cut represents a 0.50% reduction, while a 100 bps cut would represent a full 1% change.

• Monetary Policy Committee (MPC):

• The MPC is a six-member committee constituted by the Central Government under Section 45ZB of the amended RBI Act, 1934.

• The committee is chaired by the Governor of the Reserve Bank of India and is tasked with determining the policy rates required to achieve the inflation target (typically 4% with a band of +/- 2%).

• Impact of CRR Cut:

• A lower CRR results in a higher Money Multiplier, as banks have more capital to lend to consumers and businesses.

• This usually leads to a decrease in lending rates (like MCLR or EBLR), making loans for housing, automobiles, and industrial expansion more affordable.

Important Points

• Statutory Liquidity Ratio (SLR): While CRR is kept in cash with the RBI, SLR is the reserve that banks must maintain in the form of liquid assets like Gold or Government Securities before they can provide credit.

• Repo Rate: This is the rate at which the RBI lends money to commercial banks in the event of any shortfall of funds. It is the primary signal rate for the economy.

• Liquidity Management: The RBI uses instruments like Open Market Operations (OMO), CRR, and the Liquidity Adjustment Facility (LAF) to manage the volume of money in the Indian economy.

• Historical Context: CRR levels have historically fluctuated between 3% and 15% depending on the economic cycle and the RBI's objective to either suck out excess liquidity (inflation control) or inject liquidity (growth stimulus).

More previous year papers and mock tests: **www.yourmocktest.com/pyq**