RRB Technician Free Mock

Q1. The table given below shows the income of two companies C1 and C2 in 6 years.

Year	Company C1	Company C2
P	750	850
Q	200	250
R	330	350
S	550	650
T	530	270
U	370	390

Which of the following statement is NOT correct?
I. The income of C1 in year P is 33.33 percent of the income of C2 in year Q.
II. The average income of C1 and C2 in year T is 400.
(a) Only I
(b) Both I and II
(c) Neither I nor II
(d) Only II

Q2.
What is the value of $\sqrt{560 - \sqrt{169} - \sqrt{121} - \sqrt{49}}$?
(a) 22
(b) 21
(c) 23
(d) 19

Q3. Suman wants to earn 15% profit on an item after offering 35% discount. By how much percentage more than the cost price should she mark the price of her article?
(a) 75.57
(b) 76.92
(c) 76.77
(d) 78.57

Q4. The simple interest on a certain sum for 7.5 years at 12% p.a. is Rs. 3,334.5 more than the simple interest on the same sum for 5.25 years at the same rate. Find the sum.
(a) Rs. 12,350
(b) Rs. 12,050
(c) Rs. 11,550
(d) Rs. 12,000

Q5. A container contains 18.75 liter of alcohol. From this container, 3.75 liter of alcohol is taken out and replaced by water. This process is further repeated two times. How much alcohol is there in the container now?
(a) 9.5 liter
(b) 9.8 liter
(c) 8.5 liter
(d) 9.6 liter

Q6. If the price of a product is increased by 20%, by what percentage should its sales be decreased to maintain the same revenue?
(a) 18
(b) 16.67
(c) 83.33
(d) 20

Q7. A mixture contains milk and water in the ratio of 5:3. If 10 liters of the mixture is replaced with pure milk, the ratio of milk to water becomes 2:1. What was the quantity of the original mixture?
(a) 110
(b) 90
(c) 80
(d) 130

Q8. The tax on the salary is 1/5 of the salary and savings are ¼ of the salary. The ratio of the expenditures to the savings is _____ ?
(a) 11:5
(b) 5:3
(c) 7:9
(d) 9:7

Q9. A shopkeeper earns 20% on an investment but loses 40% on another investment. If the ratio of the two investments is 3:4, then the combined loss percentage is:
(a) 60%
(b) 25%
(c) 14.28%
(d) 66.67%

Q10. If the ratio of the present ages of Ram and Shyam is 5:7, and the sum of their ages is 60 years, what will be the ratio of their ages after 10 years?
(a) 6:7
(b) 5:7
(c) 7:8
(d) 7:9

Q11. If cosec θ + cot θ = 9, θ being acute, then the value of 4 sec θ is:
(a) 1/4
(b) 40/41
(c) 9/41
(d) 41/10

Q12. The ratio of expenditure to savings of a woman is 3 :1. If her income and expenditure are increased by 10% and 20%, respectively, then find the percentage change in her savings.
(a) 25%
(b) 20%
(c) 30%
(d) 40%

Q13. A book was sold for Rs. 188.76 with a profit of 21%. If it were sold for Rs. 165.75, then what would have been the percentage of profit or loss?
(a) 6.25% profit
(b) 5.5% profit
(c) 8% loss
(d) 5% loss

Q14. If 650 workers can finish construction of an apartment in 40 days, then how many workers are needed to complete the same work in 50 days?
(a) 450
(b) 520
(c) 390
(d) 500

Q15. What is the largest common divisor of the numbers 912, 1836 and 2700?
(a) 27
(b) 18
(c) 12
(d)15

Q16. If the area of an equilateral triangle is $4\sqrt{3}$, find the ratio of its height and one side.
(a) $1:1$
(b) $\sqrt{3}:4$
(c) $\sqrt{3}:2$
(d) $2\sqrt{3}:3$

Q17. The ratio of CP and MRP of a product is 10 : 11. The seller gives 10% discount on MRP on Diwali. Find the ratio of profit/loss to the cost price.
(a) 1 : 100
(b) 11 : 100
(c) 99 : 100
(d) 100 : 99

Q18. AB is the diameter of 10 cm of a circle whose centre is O. AD is chord of 6 cm. Find the sum of OB and OE. (E is the midpoint of chord)
(a) 5 cm
(b) 9 cm
(c) 8 cm
(d) 10 cm

Q19. The ratio of the monthly income of A and B is 15 : 17 and the ratio of their expenditures is 13 : 15. If both of them manage to save Rs. 2000, then find the difference in their incomes (in Rs.)
(a) 4000 Rs.
(b) 2000 Rs.
(c) 8000 Rs.
(d) 4500 Rs.

Q20. In an ODI, Indian cricketers scored some runs that is given in histogram. Find the ratio of the total score of the top 3 batsman to the last 3 scorer batsman.
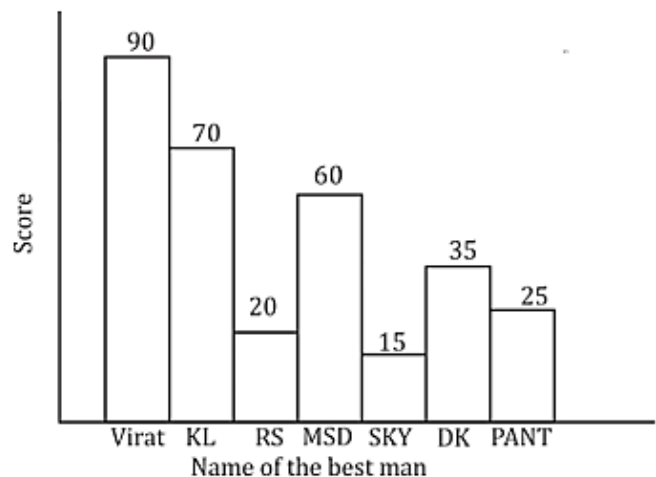
(a) 3 : 5
(b) 11 : 3
(c) 12 :8
(d) 11 : 7

Directions (21-23): The given pie-chart represents the survey report on the favourite games of a group of college students.

Percentage of people playing various games

■ Football ■ Hockey ■ Carrom ■ Volleyball ■ Others
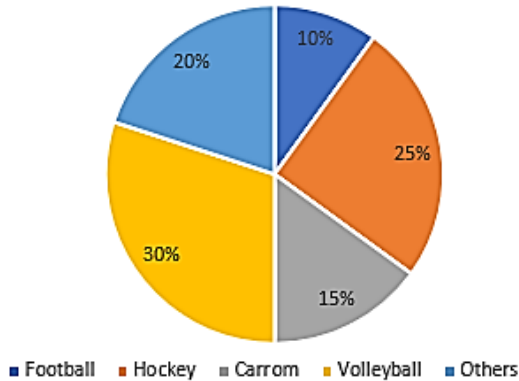
Q21. If the total number of students surveyed is 3600, find the difference between the students in hockey and carrom.
(a) 300
(b) 360
(c) 280
(d) 320

Q22. Number of students who like volleyball is what percentage of students who like football?
(a) 50%
(b) 175%
(c) 300%
(d) 80%

Q23. Find the number of students who play football and carrom.
(a) 600
(b) 900
(c) 500
(d) 450

Q24. A sum of Rs 11,000 is invested for 18 months at 12% per annum at simple interest What is the percentage gain at the end of 18 months, to the nearest whole number?
(a) 14%
(b) 15%
(c) 18%
(d) 17%

Q25. The average of 20 numbers is 75. The average of first 8 numbers is 70 and the average of next 9 numbers is 75. 18th number is 5 less than the 19th number and 19th number is 3 more than the 20th number, then what is average of 18th and 20th numbers?
(a) 81
(b) 87
(c) 85
(d) 74

Q26. In a certain code language, "PATNA" is written as "11420116" and "STEAM" is written as "13152019". How is "BIHAN" written in that code language?
(a) 2918114
(b) 291814
(c) 141892
(d) 1411892

Q27. The following equation is incorrect. Which two signs should be interchanged to correct the equation?
$36 \div 18 - 5 \times 7 + 3 = 18$
(a) + and ÷
(b) + and ×
(c) - and +
(d) ÷ and ×

Q28. Seema starts her daily walking routine. She walks 4 km East, then turns North and walks 2.5 km, then turns West and walks 4 km, then turns to her right and walks 4.5 kms. Where is she now with respect to the starting position?
(a) 5.5 km North
(b) 7 km South
(c) 5.5 km South
(d) 7 km North

Q29. In the question two statements are given, followed by two conclusions, I and II. You have to consider the statements to be true even if it seems to be at variance from commonly known facts. You have to decide which of the given conclusions, if any, follows from the given statements.
Statement I: No Helmet are Cap
Statement II: Some Cap are Scarf
Conclusion I: All Scarf are Helmet
Conclusion II: All Cap are Scarf
(a) Only conclusion I follows
(b) Only conclusion II follows
(c) Both conclusions I and II follow
(d) Neither conclusion I nor conclusion II follows

Q30. In the following question, select the missing number from the given series.

52, 69, 56, 67, ?, 65,62

(a) 61

(b) 60

(c) 58

(d) 69

Q31. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

QT, PV, OX, NZ, ?

(a) TU

(b) MB

(c) ST

(d) SU

Q32. In a certain code language, "CLASS" is written as "EOEXY". How is "SIGNS" written in that code language?

(a) ULKSY

(b) UFTDX

(c) FLKTZ

(d) TKIJY

Q33. The following equation is incorrect. Which two signs should be interchanged to correct the equation?

16 ÷ 8 - 5 x 2 + 6 = 9

(a) + and x

(b) + and ÷

(c) ÷ and +

(d) ÷ and x

Q34. In a row of boys, Ram is 17th from the right end. Mohan is 21th to the left of Ram. If Mohan is 16th from the left end, then how many boys are there in the row?

(a) 55

(b) 54

(c) 57

(d) 53

Q35. In a certain code language, "MARKS" is written as "87519" and "KITE" is written as "1463". How is "SKIMER" written in that code language?

(a) 236846

(b) 238475

(c) 914835

(d) 193847

Q36. After arranging the given words according to dictionary order, which word will come at 'Third' position?

Paradrop, Paraffle, Paradoxy, Paradise, Paranoia

(a) Paraffle

(b) Paradoxy

(c) Paradrop

(d) Paranoia

Q37. Three of the following four letter-clusters are alike in a certain way and one is different. Pick the odd one out.

ADI, JMR, KNQ, ZCH

(a) ADI

(b) JMR

(c) KNQ

(d) ZCH

Q38. Select the set in which the numbers are related in the same way as are the numbers of the following set. (NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits.)

(3,11,1), (5,33,2)

(a) (4,18,1)

(b) (5,25,3)

(c) (3,15,4)

(d) (2,20,5)

Q39. Select the odd group of numbers. (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).

(a) (8, 512, 487)

(b) (7, 343, 318)

(c) (9, 729, 704)

(d) (6, 216, 190)

Q40. Three different positions of the same dice are given below. How many dots will be on the face opposite to the showing 3?
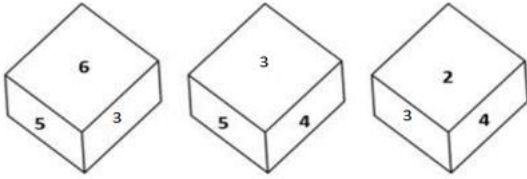
(a) 1
(b) 2
(c) 4
(d) 5

Q41. In the following question below are given some statements followed by some conclusions based on those statements. Taking the given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusion logically follows the given statements.
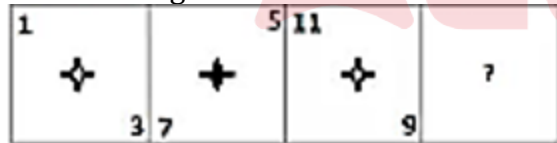**Statements:**
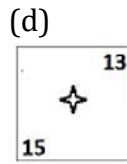I. Some Brother are Male.
II. Some Father are Male.
Conclusion:
I. Some Father are not Brother
II. No Brother is Father.
(a) Only conclusion I follows
(b) Both conclusions I and II follows
(c) Neither conclusion follows
(d) Only conclusion II follows

Q42. Select the figure from among the given options that can replace the question mark (?) in the following series.

(a)

(b)

(c)

(d)

Q43. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.
PEKG, TAPB, XWUW, BSZR, ?
(a) ENPG
(b) EMOG
(c) FOEM
(d) FPEN

Q44. Select the number from among the given options that can replace the question mark (?) in the following series.
5, 15, 41, 91, 173, 295, ?
(a) 440
(b) 465
(c) 345
(d) 540

Q45. Four letter-clusters have been given out of which three are alike in some manner and one is different. Select the one that is different.
(a) PTZ
(b) MQW
(c) JNT
(d) DHM

Q46. Read the statement and the following assumptions and decide which of the assumptions is implicit in the statement.
Statement:
"To tackle the shortage of skilled labor, the Indian government has launched an initiative to provide free vocational training in rural areas."
Assumptions:
I. There is a lack of skilled labor in certain sectors in India.
II. Vocational training in rural areas can effectively reduce this skill gap.
(a) Only assumption I is implicit.
(b) Only assumption II is implicit.
(c) Neither I nor II is implicit.
(d) Both I and II are implicit.

Q47. Read the statement and the following assumptions and decide which of the assumptions is implicit in the statement.

Statement:

"The Indian government has launched a new online platform for farmers to sell their produce directly to consumers."

Assumptions:

I. Farmers have adequate access to and knowledge of the internet to use this platform.

II. Direct selling to consumers is beneficial for farmers.

(a) Only assumption I is implicit.

(b) Only assumption II is implicit.

(c) Neither I nor II is implicit.

(d) Both I and II are implicit.

Q48. Read the statement and the following assumptions and decide which of the assumptions is implicit in the statement.

Statement: To increase security, the bank has introduced fingerprint authentication for accessing safe deposit boxes.

Assumptions:

I. Customers have concerns about the security of their safe deposit boxes.

II. All customers are comfortable using biometric authentication.

(a) Only assumption I is implicit.

(b) Only assumption II is implicit.

(c) Both assumptions I and II are implicit.

(d) Neither assumption I nor II is implicit.

Q49. In a shelf of books, Book A is to the immediate right of Book B but to the left of Book C. Book D is at the extreme right end and book B is at extreme left end. how many books are on the shelf?

(a) 4

(b) 5

(c) 6

(d) 7

Q50. Read the statement and the following conclusions and decide which of the conclusions is follows in the statement.

Statement: The health department has reported a decrease in flu cases this year compared to last year.

Conclusions:

I. The flu vaccine was more effective this year.

II. People are taking better preventive measures against the flu.

(a) Only conclusion I follows.

(b) Only conclusion II follows.

(c) Both conclusions I and II follow.

(d) Neither conclusion I nor II follows.

Q51. Oil spreads on water surface because-

(a) Oil is denser than water

(b) Oil is less dense than water

(c) Surface tension of oil is more than water

(d) Surface tension of oil is less than water

Q52. Which instrument is used for measuring humidity in the air?

(a) Hydrometer

(b) Hygrometer

(c) Spectrometer

(d) Eudiometer

Q53. The SI unit for measuring magnetic permeability is:

(a) Henry per meter

(b) Weber per meter

(c) Tesla per meter

(d) Ohm per meter

Q54. The process of splitting white light into its constituent colors is known as:

(a) Dispersion

(b) Reflection

(c) Scattering

(d) Absorption

Q55. Sound travels fastest through which of the following mediums?

(a) Air

(b) Water

(c) Steel

(d) Vacuum

Q56. Which among the following in false about work?

(a) If displacement is zero, work is zero

(b) Work done can be negative

(c) It is a vector quantity

(d) Its unit is Joule

Q57. Sound waves are characterized by which of the following properties?
(a) Amplitude and frequency
(b) Wavelength and speed
(c) Reflection and refraction
(d) Diffraction and interference

Q58. Which one of the following is used as a moderator in the nuclear reactor?
(a) Thorium
(b) Graphite
(c) Radium
(d) Ordinary water

Q59. What is the resistance (in Ω) of an electrical component if a current of 0.4A passes through it on application of 12 V of potential difference across it?
(a) 4.8
(b) 60
(c) 9.6
(d) 30

Q60. Which of the following is the most common oxidizing agent?
(a) Oxygen
(b) Hydrogen peroxide
(c) Potassium permanganate
(d) Sodium chlorate

Q61. Which element is the first element of the third period in the periodic table?
(a) Lithium
(b) Sodium
(c) Potassium
(d) Rubidium

Q62. What is a period in the periodic table?
(a) A vertical column of elements with similar properties
(b) A horizontal row of elements with consecutive atomic numbers
(c) A group of elements with the same number of valence electrons
(d) A group of elements with similar electron configurations

Q63. Brass gets discoloured in the air because of the presence of which of the following gases in the air?
(a) Oxygen
(b) Hydrogen Sulphide
(c) Carbon dioxide
(d) Nitrogen

Q64. Which of the following is an example of a non-metallic mineral?
(a) Iron ore
(b) Copper ore
(c) Graphite
(d) Bauxite

Q65. Which is the anti-coagulant substance in blood?
(a) Fibrinogen
(b) Heparin
(c) Thrombin
(d) Globin

Q66. Which phylum includes animals that have a hard exoskeleton and jointed appendages?
(a) Mollusca
(b) Arthropoda
(c) Annelida
(d) Porifera

Q67. _____ being a higher category, is the assemblage of families which exhibit a few similar characters.
(a) Order
(b) Species
(c) Genus
(d) Class

Q68. Which reserve has become India's first Dark Sky Park?
(a) Ranthambore Tiger Reserve
(b) Jim Corbett National Park
(c) Pench Tiger Reserve
(d) Kaziranga National Park

Q69. GPS stands for which one of the following?
(a) Greenwich Polar Satellite
(b) Global Police Surveillance
(c) Global Positioning System
(d) General Pacific Survey

Q70. The half-life of a radioactive substance is 10 day; it means there will be:
(a) complete decay of substance in 20 days
(b) complete decay of substance of 40 days
(c) decay of ¾ part of substance in 20 days
(d) decay of ¼ part of substance in 5 days

Q71. What is the phenomenon, which established the transverse nature of light?
(a) Reflection
(b) Interference
(c) Diffraction
(d) Polarization

Q72. Which part of the human ear is responsible for amplifying sound vibrations?
(a) Cochlea
(b) Eardrum (tympanic membrane)
(c) Ossicles (middle ear bones)
(d) Auditory nerve

Q73. The unit of which physical quantity is not Pascal?
(a) Moment of inertia
(b) Pressure
(c) Stress
(d) Young's modulus

Q74. Which of the following is an example of negative work?
(a) Lifting a box
(b) Pulling a wagon
(c) Slowing down a car
(d) Pushing a cart

Q75. Which type of magnet is used in MRI machines.
(a) Permanent magnet
(b) Electromagnet
(c) Ferromagnet
(d) Diamagnet

Q76. The heating effect in a heating coil is directly proportional to
(a) I
(b) R^2
(c) I^2
(d) $\sqrt{R}$

Q77. The gravitational force of attraction between two bodies is _____ the distance between the two bodies.
(a) Inversely proportional to the
(b) Directly proportional to the square of
(c) Inversely proportional to the square of
(d) Directly proportional to the

Q78. What observation led to the inference of a positive charge source within the atom?
(a) The atom's electrical neutrality
(b) The mass of the electron
(c) The negative charge of the electron
(d) The mass of the proton

Q79. Which compound is responsible for the greenhouse effect?
(a) Carbon monoxide (CO)
(b) Carbon dioxide (CO_2)
(c) Methane (CH_4)
(d) Ethane (C_2H_6)

Q80. Which reaction type involves an element being replaced in a compound by another element?
(a) Double displacement reaction
(b) Single displacement reaction
(c) Decomposition reaction
(d) Combination reaction

Q81. What is the process by which solid changes directly to a gas without going through the liquid state called?
(a) Melting
(b) Evaporation
(c) Sublimation
(d) Condensation

Q82. Which non-metal is essential for combustion and respiration?
(a) Hydrogen
(b) Oxygen
(c) Nitrogen
(d) Chlorine

Q83. The inert gas which is substituted for nitrogen in the air used by deep sea divers for breathing, is
(a) Argon
(b) Xenon
(c) Helium
(d) Krypton

Q84. Blood is red in color due to the presence of _____.
(a) Cytochrome
(b) Chlorophyll
(c) Hemocyanin
(d) Haemoglobin

Q85. What is the scientific name for the common house cat?
(a) Felis Catus
(b) Canis lupus
(c) Panthera pardus
(d) Equus caballus

Q86. Which of the following is not correct?
(a) Members of Chlorophyceae are commonly called green algae
(b) Members of Phaeophyceae are commonly called red algae
(c) Members of Rhodophyceae are commonly called red algae
(d) Members of Phaeophyceae are commonly called brown algae

Q87. Which of the following diseases is characterized by the progressive degeneration of nerve cells in the brain?
(a) Alzheimer's disease
(b) Parkinson's disease
(c) Multiple sclerosis
(d) Epilepsy

Q88. The alimentary canal is a long tube that extends from _____.
(a) mouth to stomach
(b) stomach to the large intestine
(c) small intestine to the anus
(d) mouth to anus

Q89. The gravitational force between two objects is 36 N. If the distance between the objects is halved while their masses remain constant, what will be the new gravitational force?
(a) 72 N
(b) 144 N
(c) 18 N
(d) 9 N

Q90. What is the resistance of a wire?
(a) The resistance of a wire is inversely proportional to its length.
(b) The resistance of a wire is directly proportional to its length.
(c) The resistance of a wire is inversely proportional to resistivity
(d) The resistance of a wire is directly proportional to its cross-sectional area.

Q91. Where is the 19th NAM Summit being held?
(a) Nairobi, Kenya
(b) Kampala, Uganda
(c) Addis Ababa, Ethiopia
(d) Johannesburg, South Africa

Q92. What is the name of the operation launched by the Army to flush out terrorists?
(a) Operation Vijay
(b) Operation Meghdoot
(c) Operation Sarvashakti
(d) Operation Black Thunder

Q93. Parakram Diwas in 2024 marked the 127th birth anniversary of which Indian freedom fighter?
(a) Mahatma Gandhi
(b) Bhagat Singh
(c) Netaji Subhas Chandra Bose
(d) Sardar Vallabhbhai Patel

Q94. Who are the joint recipients of the Indira Gandhi Prize for Peace, Disarmament, and Development for 2023?
(a) Daniel Barenboim and Ali Abu Awwad
(b) Kaivalya Vohra and Aadit Palicha
(c) Neelakantha Bhanu Prakash and Rahul Rawat
(d) Kaivalya Vohra and Daniel Barenboim

Q95. Who recently won the International Tennis Hall of Fame, becoming the first Asian men to achieve this prestigious honour?
(a) Martina Navratilova and Leander Paes
(b) Vijay Amritraj and Leander Paes
(c) Rafael Nadal and Martina Navratilova
(d) Vijay Amritraj and Martina Navratilova

Q96. Who has been named the Rising Star of the Year among women by the United World Wrestling (UWW)?
(a) Vinesh Phogat
(b) Geeta Phogat
(c) Sakshi Malik
(d) Antim Panghal

Q97. Who has been awarded the Royal Society of Chemistry's Nyholm Prize for Education?
(a) Kavita Sharma
(b) Savita Ladage
(c) Saroj Dixit
(d) Preeti Rawat

Q98. The massacre of British men, women, and children at Cawnpore (Kanpur) during the Revolt of 1857 was led by which rebel leader?
(a) Nana Sahib
(b) Bahadur Shah II
(c) Kunwar Singh
(d) Tantia Tope

Q99. When the offices of the President and Vice-President fall vacant simultaneously, who acts as President?
(a) Prime Minister of India
(b) The Chief Justice of India
(c) The Speaker of Lok Sabha
(d) The Comptroller and Auditor General of India

Q100. The function of an assembler is_____?
(a) To convert basic language into machine language
(b) To convert high level language into machine language
(c) To convert assemble language into machine language
(d) To convert assemble language into high level language

Solutions

S1. Ans.(a)
Sol.
Statement I-
Percentage=$\frac{750}{250} \times 100 = 300\%$ (False)
Statement II-
Average=$\frac{530+270}{2} = \frac{800}{2} = 400$ (True)
Hence, only I is not correct.

S2. Ans.(c)
Sol.
$=\sqrt{560 - \sqrt{169} - \sqrt{121} - \sqrt{49}}$
$= \sqrt{560 - 13 - 11 - 7}$
$= \sqrt{529}$
$= 23$

S3. Ans.(b)
Sol.
We know that

CP		MRP
100−D	:	100+P
65	:	115

Req.% = $\frac{50}{65} \times 100 = 76.92\%$

S4. Ans.(a)
Sol.
S.I = Time × Rate
$\left.\begin{array}{l} SI_1 = 7.5 \times 12\% = 90\% \\ SI_2 = 5.25 \times 12\% = 63\% \end{array}\right) + 27\% \longrightarrow 3334.5$ Rs.
1%------123.5
100% $\longrightarrow$ 12350 Rs.
Sum= Rs. 12350

S5. Ans.(d)
Sol.
Total alcohol = 18.75 liter
Taken out alcohol = 3.75 liter
$\frac{3.75}{18.75} = \left(\frac{-1}{5}\right)$

$\begin{array}{lll} 5 & : 4 \\ 5 & : 4 \\ \underline{5} & \underline{: 4} & \times 0.15 \\ 125 & : 64 \longrightarrow & 9.6 \text{ liter} \\ \downarrow \\ 18.75 \text{ liter} \end{array}$

S6. Ans.(b)
Sol.
price × numbers of sales = total revenue
$\frac{120}{100} \times$ sales = 1 (for no change)
sales = $\frac{100}{120}$
sales decreased % = $\frac{120-100}{120} \times 100 = 16.666\% \sim 16.67\%$

S7. Ans.(b)
Sol. Milk: Water
5: 3
After removing 10 L mixture, remaining ratio = 5: 3
After adding 10 L milk, ratio is 2: 1 or 6: 3 we can say
Milk quantity = 6-5 = 1 unit = 10 l
After removing 10 L mixture, remaining milk and water 50 L and 30 L respectively. Total = 80 L
Original mixture = 80 L + 10 L = 90 L

S8. Ans.(a)
Sol.
Let the salary be x.
Tax = $\frac{1}{5}$ of salary
= $\frac{1}{5} \times X = \frac{x}{5}$
Savings = $\frac{1}{4} \times X = \frac{x}{4}$
Expenditure = Salary – Tax – Savings
= $X - \frac{x}{5} - \frac{x}{4}$
= $\frac{20x - 4x - 5x}{20} = \frac{11x}{20}$
Ratio = $\frac{\frac{11x}{20}}{\frac{x}{4}} = \frac{11}{20} \times \frac{4}{1} = \frac{11}{5}$

S9. Ans.(c)
Sol.
Let the investments be 3x and 4x.
In first investment, he earned 20%
So, Return on first investment = 120% of 3x
Similarly,
After 40% loss on second investment,
Return = 60% of 4x
Net return = 120% of 3x + 60% of 4x = $\frac{360x + 240x}{100}$
= $\frac{600x}{100}$ = 6x
Net investment = 3x + 4x = 7x
Loss = $\frac{7x - 6x}{7x} \times 100$
= $\frac{x}{7x} \times 100 = \frac{100}{7}\% = 14\frac{2}{7}\% = 14.28\%$

S10. Ans.(d)
Sol. Let the age of Ram be 5x and the age of Shyam be 7x.
Sum of ages of Ram and Shyam = 60
5x + 7x = 60
12x = 60 ⇒ x = 5
Ram's age after 10 years = 5x + 10
= 5 × 5 + 10 = 35 years
Shyam's age after 10 years = 7x + 10
= 7 × 5 + 10 = 45 years
Ratio = 35: 45 = 7: 9

S11. Ans.(d)
Sol.
$\begin{bmatrix} \csc^2\theta - \cot^2\theta = 1 \\ (\csc\theta - \cot\theta)(\csc\theta + \cot\theta) = 1 \end{bmatrix}$
$\csc\theta + \cot\theta = 9$ (Given)
$\csc\theta - \cot\theta = \frac{1}{9}$
$2\csc\theta = \frac{82}{9}$
$\csc\theta = \frac{41}{9}$
$\sin\theta = \frac{9}{41}$, $\cos\theta = \frac{40}{41}$,
$4\sec\theta = \frac{41}{40} \times 4 = \frac{41}{10}$

S12. Ans.(b)
Sol.
Expenditure + Savings = Income
$+20\% \begin{pmatrix} 300 + & 100 = & 400 \\ +60 - & x = & +40 \end{pmatrix} + 10\%$
Expenditure = 360, income = 440
Saving = 440 – 360 = 80
Hence, percentage decreased change in savings = $\frac{100-80}{100} \times 100 = 20\%$

S13. Ans.(a)
Sol.
According to question,
121% – 188.76
100%= 156
Now CP=156, if SP= 165.75
Profit %= $\frac{9.75 \times 100}{156}$ = = 6.25%

S14. Ans.(b)
Sol.
Total work = 650 × 40
Required answer = $\frac{650 \times 40}{50}$ = 520

S15. Ans.(c)
Sol. largest common divisor means H.C.F
912= 2 × 2 ×2× 2 ×19×3
1836= 2× 2 × 3× 3 ×3× 17
2700= 2× 2 ×3× 3 ×3 ×5× 5
Hence H.C.F= 2×2×3=12

S16. Ans.(c)
Sol.
Area of equilateral triangle is $\frac{\sqrt{3}}{4}a^2$
So $\frac{\sqrt{3}}{4}a^2 = 4\sqrt{3}$

$a^2 = 4 \times 4 \Rightarrow a = 4$ (side of the triangle)
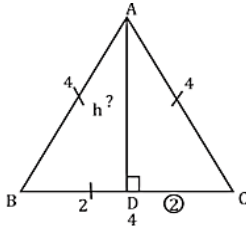
In equilateral triangle –
Line that connects vertex and the midpoint of opposite side of triangle or we can say front side of the vertex is always be vertical on that side. As it is present in fig.
In $\triangle ADC$
$AD = \sqrt{(AC)^2 - (DC)^2}$
$= \sqrt{16 - 4}$
$= \sqrt{12} = 2\sqrt{3}$
Ratio of $\frac{H}{S} = \frac{2\sqrt{3}}{4} \Rightarrow H : S = \sqrt{3} : 2$

S17. Ans.(a)
Sol.
Let CP is 100

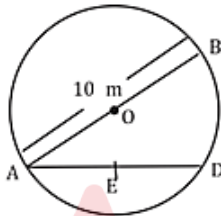$\frac{10}{11} = \frac{CP}{MRP} = \frac{100}{?} \Rightarrow \frac{100}{110}$

10% discount on MRP = $110 \times \frac{10}{100} \Rightarrow 11$ Rs.

Discounted price is 99 ⇒ so seller will have 1% loss = Rs. 1 loss on this deal.
So, ratio of Loss and Cost Price is 1: 100

S18. Ans.(b)
Sol.
AB is the diameter of the circle so OB is a radius of circle.

Given – AB = 10 cm
    OB = 5 cm, AO = 5 cm
AD is the chord of 6 cm and E is the midpoint of the chord
So, AE = 3 cm
If we connect O to E we find a right angel triangle AOE.
$OE = \sqrt{(AO)^2 - (AE)^2}$

$= \sqrt{(5)^2 - (3)^2}$

$= \sqrt{25 - 9} = \sqrt{16} = 4$

So, OB+OE = 5+4 = 9 cm

S19. Ans.(b)
Sol. Let the monthly income of A be 15x and B be 17x, where x is a constant.
Similarly, let the monthly expenditure of A be 13y and B be 15y.
We know that both of them manage to save Rs. 2000 each month, so we have:
15x - 13y = 2000 ---(1)
17x - 15y = 2000 ---(2)

Multiplying equation (1) by 15 and equation (2) by 13, we get:
15x – 13y = 17x – 15y
2y = 2x
y = x
by eq. (i), 15x – 13x = 2000
2x = 2000, x = 1000 and y also 1000
Therefore, A's monthly income = 15x = 15(1000) = Rs. 15,000
B's monthly income = 17x = 17(1000) = Rs. 17,000
The difference in their incomes = B's income - A's income = Rs. (17,000 - 15,000) = Rs. 2,000.
Hence, the difference in their incomes is Rs. 2,000.

S20. Ans.(b)
Sol.
Virat, KL and MSD are top 3 scorer
Total runs by them = 90+70+60 = 220
RS, SKY and Pant are last 3 scorers
Total runs by them = 15+20+25 = 60
So the asked ratio = $\frac{\text{top 3 scorers}}{\text{last 3 scorers}}$
$= \frac{220}{60} = \frac{22}{6} = \frac{11}{3} \Rightarrow 11 : 3$

S21. Ans.(b)
Sol. Students in Hockey = 25%
Students in Carrom = 15%
Difference = 10%
= 10% of 3600 = 360

S22. Ans.(c)
Sol.
Required % = $\frac{30\%}{10\%} \times 100$
= 300%

S23. Ans.(b)
Sol.
% = 10 + 15 = 25%
No. of students = 25% of 3600
$= \frac{25}{100} \times 3600$
= 900

S24. Ans.(c)
Sol.
SI = $11000 \times \frac{12}{100} \times \frac{18}{12} = 1980$
Gain % = $\frac{1980}{11000} \times 100 = 18\%$

S25. Ans.(b)
Sol.
Total sum of numbers = 20 × 75 = 1500
Sum of first 8 numbers = 8 × 70 = 560
Sum of next 9 numbers = 9 × 75 = 675
Remaining numbers = (20 − 8 − 9) = 3 (which is 18th, 19th and 20th)
Remaining sum of $18^{th} + 19^{th} + 20^{th}$ = 1500 − 560 − 675 = 265
Let 20th number be x
19th number = x + 3
18th number = x+ 3 − 5 = x − 2
x −2 + x+ 3 + x = 265
3x = 264, x = 88
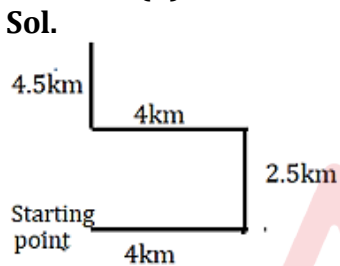Required average = $\frac{(88-2)+88}{2} = \frac{174}{2} = 87$

S26. Ans.(c)
Sol. Number represents the position of corresponding alphabets in reverse order.
PATNA→11420116
STEAM→13152019
BIHAN→141892

S27. Ans.(b)
Sol. 36 ÷ 18 − 5 × 7 + 3 = 18
Interchanging + and ×
36 ÷ 18 − 5 + 7 × 3 = 2 − 5 + 21 = 18

S28. Ans.(d)
Sol.

S29. Ans.(d)
Sol.
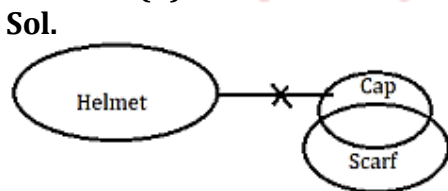
Neither conclusion I nor conclusion II follows

S30. Ans.(b)
Sol. The series follow +17, -13, +11, -7, +5, -3 pattern

S31. Ans.(b)
Sol. −1, +2 series

S32. Ans.(a)
Sol.
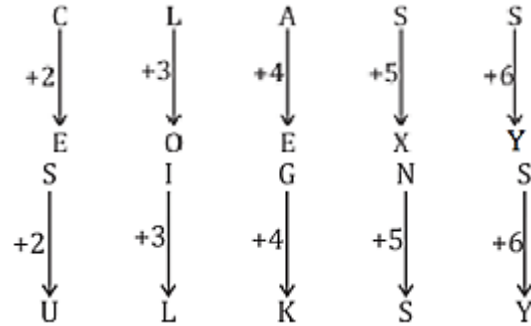
S33. Ans.(a)
Sol.
$16 \div 8 - 5 \times 2 + 6 = 9$
$\Rightarrow 16 \div 8 - 5 + 2 \times 6 = 9$
$\Rightarrow 2 - 5 + 12 = 9$
$\Rightarrow 14 - 5 = 9$
$\Rightarrow 9 = 9$

S34. Ans.(d)
Sol.
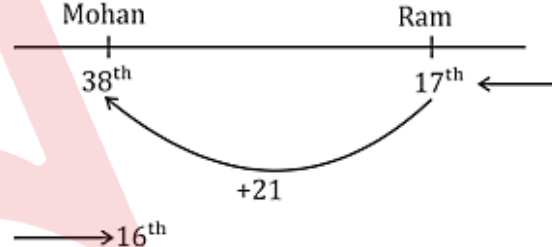
∴ Total No. of Boys
= 38 + 16 − 1 = 53

S35. Ans.(c)
Sol.

M	A	R	K	S		K	I	T	E
8	7	5	1	9		1	4	6	3

Then, SKIMER → 914835

S36. Ans.(c)
Sol. Acc. to dictionary, Paradise, Paradoxy, Paradrop, Paraffle, Paranoia
Third word would be : Paradrop

S37. Ans.(c)
Sol.
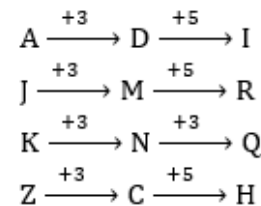
S38. Ans.(a)
Sol.
In (3, 11, 1),
$3^2 + 2 \times (1)^2 = 11$
In (5, 33, 2),
$5^2 + 2 \times (2)^2 = 25 + 8 = 33$
In (4, 18, 1)
$4^2 + 2 \times (1)^2 = 16 + 2 = 18$

S39. Ans.(d)
Sol. Second number = (First number)^3
Third number = Second number – 25

S40. Ans.(a)
Sol. 5 – 2 (from 2ⁿᵈ and 3ʳᵈ fig because of 3, 4 are common)
6 – 4 (from 1ˢᵗ and 2ⁿᵈ fig because of 3, 5 are common)
So, 1 – 3

S41. Ans.(c)
Sol.

S42. Ans.(c)
Sol. Option c is correct.

S43. Ans.(c)
Sol. The pattern is

S44. Ans.(b)
Sol.

S45. Ans.(d)
Sol.
The pattern followed here is

(a) $PTZ \rightarrow P \xrightarrow{+4} T \xrightarrow{+6} Z$

(b) $MQW \rightarrow M \xrightarrow{+4} Q \xrightarrow{+6} W$

(c) $JNT \rightarrow J \xrightarrow{+4} N \xrightarrow{+6} T$
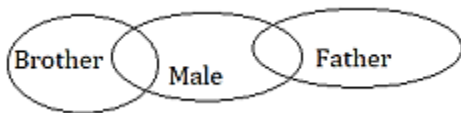
(d) $DHM \rightarrow D \xrightarrow{+4} H \xrightarrow{+5} M$

S46. Ans.(d)
Sol. The initiative indicates an understanding that there is a shortage of skilled labor (Assumption I), and that providing vocational training in rural areas is a viable solution to bridge this gap (Assumption II).

S47. Ans.(b)
Sol. While the platform's existence might imply an assumption about farmers' internet access (Assumption I), the more directly implied assumption is that selling produce directly to consumers is advantageous for farmers (Assumption II).

S48. Ans.(a)
Sol. Only assumption I is implicit.
Explanation: The introduction of fingerprint authentication is likely based on security concerns, suggesting the bank assumes customers are worried about security (I). There's no clear indication that all customers would be comfortable with biometric authentication (II), making A the correct answer.

S49. Ans.(a)
Sol. The sequence from left to right is:
Book B, Book A, Book C, Book D.

S50. Ans.(d)
Sol. Correct Answer: d) Neither conclusion I nor II follows.
While a decrease in flu cases might suggest effective vaccines or better preventive measures, the statement doesn't provide direct evidence for either conclusion, making D the correct answer.

S51. Ans.(d)
Sol. The answer is (d). Oil spreads on the water surface because the surface tension of oil is less than the surface tension of water.
- Surface tension is the force that acts on the surface of a liquid, causing it to behave as if it were a stretched membrane. The surface tension of a liquid is determined by the strength of the intermolecular forces between the molecules of the liquid.
- In the case of oil and water, the intermolecular forces between the molecules of oil are weaker than the intermolecular forces between the molecules of water. This means that the surface tension of oil is less than the surface tension of water.
- When oil is placed on the surface of water, the surface tension of the water pulls the oil molecules down, trying to make the surface as smooth as possible. However, the surface tension of the oil is not strong enough to resist the pull of the water, so the oil molecules spread out over the surface of the water.
- The density of oil is also a factor in why it spreads on water. Oil is less dense than water, so it floats on the surface. This means that the oil molecules are not pulled down as strongly by gravity as the water molecules, which allows them to spread out more easily.

So, the answer to the question is (d). Oil spreads on the water surface because the surface tension of oil is less than the surface tension of water.

S52. Ans.(b)
Sol. The instrument used for measuring humidity in the air is a hygrometer. A hygrometer is specifically designed to measure the moisture content or relative humidity in the atmosphere. It provides a quantitative measurement of the amount of water vapor present in the air.
Other options Detail:
- Hydrometer: A hydrometer is an instrument used to measure the specific gravity or density of a liquid. It is not designed to measure humidity in the air.
- Spectrometer: A spectrometer is an instrument used to analyze the interaction between light and matter. It is commonly used in scientific research and various fields to determine the properties of substances based on their interaction with light. While spectrometers can provide valuable information about the composition of the atmosphere, they are not primarily used for measuring humidity.
- Eudiometer: An eudiometer is a laboratory device used for measuring the volume changes in chemical reactions. It is typically employed in the study of gases and their reactions. It is not intended for measuring humidity in the air.

In summary, the correct instrument for measuring humidity in the air is a hygrometer.

S53. Ans.(a)
Sol. The correct answer is (a). Henry per meter (H/m) is the SI unit for measuring magnetic permeability.
Magnetic permeability is a measure of how easily a material can be magnetized. The higher the permeability, the easier it is to magnetize the material.
The SI unit of magnetic permeability is named after Joseph Henry, an American physicist who invented the electromagnet.
Here are the other options and their correct units:
- Weber per meter (Wb/m) is the SI unit for measuring magnetic flux.
- Tesla per meter (T/m) is the SI unit for measuring magnetic field strength.
- Ohm per meter (Ω/m) is the SI unit for measuring electrical resistivity.

S54. Ans.(a)
Sol. The process of splitting white light into its constituent colors is known as (a) Dispersion.
- Dispersion refers to the phenomenon where white light is separated into its component colors as it passes through a medium, such as a prism or a droplet of water. This occurs because different colors of light have different wavelengths and thus undergo different degrees of refraction, causing them to diverge and form a spectrum.
- Reflection involves the bouncing back of light from a surface when it encounters that surface. While reflection can occur from various surfaces, it does not inherently split white light into its constituent colors. Rather, reflection preserves the properties of the incident light, including its color, as it reflects off the surface.

- Scattering occurs when light interacts with particles or objects in its path, causing it to deviate from its original path. While scattering can alter the direction of light, it does not typically separate white light into its constituent colors. However, certain types of scattering, such as Rayleigh scattering, can result in the scattering of shorter wavelengths of light (like blue and violet) more than longer wavelengths (like red and orange), which can give rise to a bluish color in the scattered light.
- Absorption refers to the process in which light energy is absorbed by a material or substance. When light is absorbed, it is converted into another form of energy (such as heat) within the absorbing material. Absorption does not involve the separation of white light into its constituent colors but rather the conversion of light energy into other forms of energy by a substance.

S55. Ans.(c)
Sol. The answer is (c) Steel.
Sound travels fastest through solids, followed by liquids and then gases. This is because the molecules in a solid are more tightly packed together than in a liquid or gas, which allows sound waves to travel more quickly through it.
In fact, sound waves travel over 17 times faster through steel than through air. So, the correct answer is (c).
Here is a table showing the speed of sound in different mediums:

Medium	Speed of Sound (m/s)
Air	343
Water	1,482
Steel	5,120
Vacuum	0

S56. Ans.(c)
Sol. Whenever a force is applied to an object, causing the object to move, work is done by the force. Work done due to displacement caused by a force is a scalar quantity. Work can be either positive or negative. The unit of work is the unit of energy, the joule (J). 1 J = 1 N m.

S57. Ans.(a)
Sol. Amplitude refers to the maximum displacement of particles in the medium from their rest position, while frequency represents the number of oscillations or cycles of the wave per second.

S58. Ans.(b)
Sol. The correct answer is (b) Graphite.
Graphite is commonly used as a moderator in nuclear reactors. A moderator is a material that slows down fast-moving neutrons produced during nuclear fission reactions. By slowing down the neutrons, the probability of their interaction with other fissile atoms, such as uranium-235 or plutonium-239, increases. This facilitates the sustained chain reaction necessary for the efficient operation of a nuclear reactor.
Graphite is an excellent moderator because it contains carbon atoms, which have a relatively low atomic mass and can effectively slow down neutrons. Other materials, such as heavy water (which contains the isotope deuterium) or ordinary water (when used in conjunction with enriched uranium fuel), can also act as moderators, but graphite is a more common choice in many types of reactors.

S59. Ans.(d)
Sol. We know that V=IR
R =V/I
=12/0.4
= 120/4
R = 30 Ω

S60. Ans.(a)
Sol. Oxygen is the most common oxidizing agent because it is readily available in the atmosphere. It is also a strong oxidizing agent, meaning that it can easily remove electrons from other substances. This makes it useful for a variety of chemical reactions, including combustion, respiration, and the production of metals.
- Hydrogen peroxide is a weaker oxidizing agent than oxygen, and it is not as readily available. It is often used as a disinfectant or bleaching agent.

- Potassium permanganate is a strong oxidizing agent, but it is not as common as oxygen. It is often used in chemical reactions to produce other compounds.
- Sodium chlorate is a strong oxidizing agent, but it is not as common as oxygen. It is often used in explosives and fireworks.

S61. Ans.(b)
Sol. Sodium (Na) is the first element of the third period in the periodic table with the atomic number 11 and the electron configuration 2,8,1. Sodium is an alkali metal with a silvery-white metallic appearance and is soft enough to be easily cut with a knife.

The third period includes elements from sodium (Na) to argon (Ar).
- Lithium - first element of the second period.
- Potassium - first element of the fourth period.
- Rubidium - second element of the fifth period

S62. Ans.(b)
Sol. A period in the periodic table is a horizontal row of elements with consecutive atomic numbers.
- The Modern Periodic Table has 18 vertical columns known as 'groups' and 7 horizontal rows known as 'periods'. The elements in a period have consecutive atomic numbers. The periods have been numbered from 1 to 7 (in Arabic numerals).

S63. Ans.(b)
Sol. Brass gets discolored in the air because of the presence of hydrogen sulfide. Hydrogen sulfide is a colorless, flammable gas that has a strong odor of rotten eggs. It is produced by the decay of organic matter, such as sewage and manure. Hydrogen sulfide can also be found in natural gas and volcanic gases.

When brass is exposed to hydrogen sulfide, the copper and zinc in the brass react with the hydrogen sulfide to form copper sulfide and zinc sulfide. These sulfides are black, so they cause the brass to turn black.

Brass: Brass is an alloy of copper and zinc. It is a yellow, dull gold metal that is often used in jewelry, musical instruments, and other decorative items. Brass is also used in some industrial applications, such as plumbing fixtures and electrical connectors.

S64. Ans.(c)
Sol. Graphite is an example of a non-metallic mineral. It is a form of carbon with a layered structure. Graphite is known for its softness, black color, and excellent electrical conductivity. It is commonly used as a lubricant, in batteries, as a material for electrodes, and in various other industrial applications.

Iron ore and copper ore are examples of metallic minerals as they contain significant amounts of metals like iron and copper, respectively. Bauxite is an ore from which aluminum is extracted and is also considered a metallic mineral.

S65. Ans.(b)
Sol. Heparin is an anticoagulant substance that is naturally present in the body, particularly in mast cells and basophils. It helps to prevent blood clots from forming by inhibiting the activity of clotting factors, specifically thrombin, and factor Xa.
- Fibrinogen is a clotting factor in the blood that is converted to fibrin during the coagulation process. Thrombin is an enzyme that helps to convert fibrinogen to fibrin and plays a key role in the formation of blood clots. Globin, on the other hand, is a protein found in hemoglobin, which is responsible for transporting oxygen in the blood.

S66. Ans.(b)
Sol. Arthropods, such as insects and crustaceans, have a hard exoskeleton and jointed appendages.
- Mollusca is a phylum of animals that have soft bodies.
- Annelida includes animals with segmented bodies
- Porifera includes animals with porous bodies.

S67. Ans.(a)
Sol. Order being a higher category, is the assemblage of families which exhibit a few similar characters

S68. Ans.(c)
Sol. The correct answer is (c) Pench Tiger Reserve. Pench Tiger Reserve, located in Maharashtra, was designated as India's first Dark Sky Park in January 2024. This recognition honors the reserve's efforts in preserving the night sky from light pollution and creating an ideal environment for astronomical observation and stargazing.

About India's First Dark Sky Park:
- The Pench Tiger Reserve (PTR) in Maharashtra is India's first Dark Sky Park within a tiger reserve for earmarking areas around the park that restrict light pollution for stargazers to access pristine dark skies.
- Dark Sky Place certification focuses on lighting policy, dark sky-friendly retrofits, outreach and education, and monitoring the night sky.
- This designation positions PTR as a sanctuary where tourists can witness celestial spectacles, shielded from the intrusion of artificial light pollution.
- PTR became the fifth such park in Asia.
- The certification was given by the International Dark-Sky Association, a global dark-sky movement to promote astronomy.

Key Facts about Pench Tiger Reserve (PTR):
- Location: The Reserve is located in the southern reaches of the Satpura hills in the Seoni and Chhindwara districts in Madhya Pradesh and continues in Nagpur district in Maharashtra as a separate Sanctuary.
- It is named after the Pench River, which flows from north to south through the Reserve.
- It comprises the Indira Priyadarshini Pench National Park, the Pench Mowgli Sanctuary, and a buffer.
- The area of the Pench Tiger Reserve and the surrounding area is the real story area of Rudyard Kipling's famous "The Jungle Book".

S69. Ans.(c)
Sol. GPS stands for Global Positioning System. It is a satellite-based navigation system that provides location and timing information anywhere on Earth. The system consists of a network of satellites orbiting the Earth, ground-based control stations, and GPS receivers. GPS receivers receive signals from multiple satellites and use the timing and location information embedded in those signals to calculate the receiver's precise location. GPS technology is widely used for navigation, mapping, surveying, and various other applications.

S70. Ans.(c)
Sol. The half life of a radioactive substance is 10 days; it means in next 10 days there will be half of the remaining radioactive substance. Thus, total 20 days, there will be decay of 75% or ¾ part of substance.

S71. Ans.(d)
Sol. The phenomenon that established the transverse nature of light is polarization.
- Polarization refers to the orientation of the electric field vector associated with a light wave. It was observed and studied extensively by French physicist Augustin-Jean Fresnel in the early 19th century. Through his experiments and analysis, Fresnel established that light consists of transverse waves, meaning the oscillations of the electric and magnetic fields are perpendicular to the direction of propagation.
- When light is polarized, its electric field oscillates in a specific direction, and the wave vibrations occur in a plane perpendicular to that direction. This phenomenon was crucial in understanding the wave nature of light and differentiating it from other types of waves.

Therefore, option (d) polarization is the phenomenon that established the transverse nature of light.

S72. Ans.(c)
Sol. The ossicles, consisting of the malleus, incus, and stapes, amplify sound vibrations from the eardrum and transmit them to the inner ear.

S73. Ans.(a)
Sol. The correct answer is (a) Moment of inertia.
The unit of moment of inertia is not Pascal. Moment of inertia is a property related to the distribution of mass in a rotating body and is expressed in units such as kilogram-meter squared (kg·m2) in the SI system. It is not directly related to pressure, stress, or Young's modulus, which are all measured in Pascal (Pa) or derived from Pascal.

S74. Ans.(c)
Sol. Slowing down a car. Negative work is done when the force applied is in the opposite direction to the displacement of the object. Slowing down a car requires a force opposite to its direction of motion, hence negative work is done.

S75. Ans.(b)
Sol. MRI machines use strong magnetic fields to produce images of the body's internal structures. These magnetic fields are produced by electromagnets, which are coils of wire with a current running through them that produce a magnetic field when energized.

S76. Ans.(c)
Sol. The heating effect of electric current depends on the resistance (R) of the conductor, the time (t) for which current flows and the amount of current (I).
$H = I^2Rt$

S77. Ans.(c)
Sol. Newton's law of universal gravitation states that every point mass in the universe attracts every other point mass with a force that is directly proportional to the product of their masses, and inversely proportional to the square of the distance between them.

S78. Ans.(a)
Sol. The observation of the deflection of alpha particles (positively charged particles) in an experiment conducted by Ernest Rutherford in 1911 led to the inference of a positive charge source within the atom.
Rutherford aimed alpha particles at a thin sheet of gold foil and expected them to pass through undeflected, as predicted by the prevailing model of the atom at the time. However, some of the particles were deflected at large angles or even reflected back towards the source, which suggested the presence of a concentrated positive charge within the atom. Rutherford concluded that the positive charge was located in a small, dense nucleus at the center of the atom.
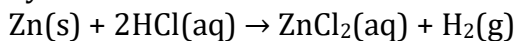
S79. Ans.(b)
Sol. The compound responsible for the greenhouse effect is Carbon dioxide (CO_2).
While all the options mentioned (a) Carbon monoxide (CO), (b) Carbon dioxide (CO2), (c) Methane (CH_4), and (d) Ethane (C_2H_6) are greenhouse gases, carbon dioxide (CO_2) is the primary greenhouse gas contributing to the greenhouse effect. It plays a significant role in trapping heat in the Earth's atmosphere and contributing to global warming.
Note - Carbon dioxide is not the only greenhouse gas, but it is the most important one. Other greenhouse gases include methane, nitrous oxide, and water vapor. However, carbon dioxide is the most abundant greenhouse gas in the atmosphere, and it is the one that is increasing the most rapidly.

S80. Ans.(b)
Sol. In a single displacement reaction, one element (usually a metal) replaces another element in a compound. This is often seen in reactions of metals with acids or with salts of less reactive metals. For example, the reaction of zinc metal with hydrochloric acid:
$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$
Here, zinc displaces hydrogen from hydrochloric acid to form zinc chloride and hydrogen gas.
- The other options are not single displacement reactions. A double displacement reaction is a type of chemical reaction in which two compounds exchange ions to form two new compounds.
- A decomposition reaction is a type of chemical reaction in which a compound breaks down into two or more simpler compounds.
- A combination reaction is a type of chemical reaction in which two or more elements or compounds combine to form a new compound.

S81. Ans.(c)
Sol. Sublimation is the process by which a solid change directly to a gas without going through the liquid state.
- Melting: The process of a solid changing into a liquid by gaining heat energy.
- Evaporation: The process of a liquid changing into a gas by gaining heat energy.
- Condensation: The process of a gas changing into a liquid by losing heat energy.

S82. Ans.(b)
Sol. Oxygen is a non-metal that is essential for both combustion and respiration. Combustion is a chemical reaction that occurs when a fuel reacts with oxygen to produce heat and light. Respiration is a biological process that occurs when cells use oxygen to produce energy.
Hydrogen, nitrogen, and chlorine are all non-metals, but they are not essential for combustion or respiration. Hydrogen is a flammable gas that can be used as a fuel, but it is not essential for combustion. Nitrogen is a gas that makes up about 78% of the Earth's atmosphere, but it is not essential for respiration. Chlorine is a poisonous gas that is used to disinfect water, but it is not essential for respiration.

S83. Ans.(c)
Sol. Helium is often used as a substitute for nitrogen in deep-sea diving because it has a lower density and is less soluble in body tissues compared to nitrogen. This helps to reduce the risk of decompression sickness, also known as "the bends," which can occur when divers ascend too quickly and nitrogen bubbles form in their tissues. Helium is also less likely to cause nitrogen narcosis, a condition that can impair judgment and coordination at deeper depths.
While other inert gases like argon, xenon, and krypton are also chemically unreactive, they are not commonly used as substitutes for nitrogen in diving due to various factors such as availability, cost, and physiological considerations.
Helium:
- Helium is a colorless, odorless, and tasteless gas that is found in natural gas and is also produced by the decay of radioactive elements. It is the second most abundant element in the universe, after hydrogen.
- Helium is used in a variety of applications, including balloons, blimps, airships, and cryogenics. It is also used in welding and as a shielding gas in arc welding.

S84. Ans.(d)
Sol. Blood is red in color due to the presence of Haemoglobin.
- Haemoglobin is a protein found in red blood cells that is responsible for carrying oxygen from the lungs to the tissues of the body. It contains iron, which gives blood its red color. When oxygen binds to the iron in hemoglobin, the molecule changes shape and becomes brighter red, and when it releases oxygen in the tissues, it becomes darker red.
- Cytochrome is a protein that is involved in the electron transport chain in the mitochondria.
- Chlorophyll is a green pigment found in plants that is responsible for photosynthesis.
- Hemocyanin is a copper-containing protein found in the blood of some invertebrates.

S85. Ans.(a)
Sol. Felis catus is the scientific name for the common house cat.
- Canis lupus is the scientific name for the gray wolf.
- Panthera pardus is the scientific name for the leopard.
- Equus caballus is the scientific name for the domestic horse.

S86. Ans.(b)
Sol. The members of Phaeophyceae are popularly called brown algae. Members of Chlorophyceae are commonly called green algae. The Rhodophyceae or Red algae are probably the oldest Eukaryotic Algae groups.

S87. Ans.(a)
Sol. Alzheimer's disease is a neurodegenerative disorder characterized by the progressive degeneration and loss of nerve cells (neurons) in the brain. This degeneration primarily affects regions of the brain involved in memory, thinking, and behavior, leading to cognitive decline and memory loss.
- Parkinson's disease is another neurodegenerative disorder characterized by the degeneration of dopamine-producing neurons in the brain, which leads to motor symptoms such as tremors, rigidity, and difficulty with movement.
- Multiple sclerosis is an autoimmune disease in which the immune system mistakenly attacks the protective covering of nerve fibers, resulting in communication problems between the brain and the rest of the body. It can lead to a wide range of symptoms depending on which nerves are affected.
- Epilepsy is a neurological disorder characterized by recurrent seizures, which are caused by abnormal electrical activity in the brain.

S88. Ans.(d)
Sol. The alimentary canal is the whole passage along which food passes through the body from mouth to anus during digestion.
- It is the pathway through which food travels in the body, and where the process of digestion and absorption of nutrients takes place.
- The alimentary canal is composed of several organs that are connected in a continuous tube, including the mouth, pharynx, esophagus, stomach, small intestine, large intestine, and anus.

S89. Ans.(b)
Sol. The gravitational force between two objects is inversely proportional to the square of the distance between them. So if the distance is halved, the gravitational force will be four times as strong.
The new gravitational force will be 36 N * 4 = 144 N.
So the answer is (b).

S90. Ans.(b)
Sol. The answer is (b). The resistance of a wire is directly proportional to its length and inversely proportional to its cross-sectional area. This is known as the resistance formula, which is given by:
$R = \rho L/A$
where:
- R is the resistance of the wire in ohms
- ρ is the resistivity of the material of the wire in ohm-meters
- L is the length of the wire in meters
- A is the cross-sectional area of the wire in square meters

So, as the length of the wire increases, the resistance increases. And as the cross-sectional area of the wire increases, the resistance decreases. Hence, the correct answer is (b).

S91. Ans.(b)
Sol. The Correct answer is (b) Kampala, Uganda
- The 19th Summit of the NAM was held in Kampala, Uganda, with the theme of "Deepening Cooperation for Shared Global Affluence".
- Uganda has taken over as chair from Azerbaijan, to run until 2027.
About NAM:
- The NAM was established in 1961 in Belgrade, Yugoslavia, through the initiative of five leaders of newly independent countries: Josip Broz Tito of Yugoslavia, Gamal Abdel Nasser of Egypt, Jawaharlal Nehru of India, Sukarno of Indonesia, and Kwame Nkrumah of Ghana.
- At present, the Movement has 120 Member States, 17 Observer Countries and 10 Observer organizations.

S92. Ans.(c)
Sol. The Correct answer is (c) Operation Sarvashakti
In response to escalating terrorist activities in Jammu and Kashmir, the Indian Army is launching Operation Sarvashakti, a strategic initiative aimed at curbing the influence of Pakistani proxy terrorist groups. Focused on the Pir Panjal mountain ranges in the Union Territory, this operation seeks to eliminate terrorists operating in the sensitive Rajouri Poonch sector.
Operation Sarvashakti aims to conduct combined counter-terrorist operations on both sides of the Pir Panjal ranges. The Srinagar-based Chinar Corps and the Nagrota-headquartered White Knight Corps will execute simultaneous operations to neutralize terrorist threats. Coordinated efforts involving the Jammu and Kashmir Police, CRPF, Special Operations Group, and intelligence agencies are crucial components of this operation.
Operation Meghdoot:
- Operation Meghdoot was a crucial operation undertaken by the Indian Army to secure control of the Siachen Glacier in the Ladakh region of Jammu and Kashmir.
- It was the codename for the Indian Army's operation to gain control of the strategically important Siachen Glacier, located at an altitude of over 5,000 meters.
- Executed on April 13, 1984, it marked the first military offensive of its kind at such high altitudes.
- The operation aimed to preempt Pakistan's attempt to capture the glacier and secure Indian interests in the region.
Operation Black Thunder:
The term "Operation Black Thunder" refers to two major military operations that took place in India during the late 1980s, both aimed at flushing out pro-Khalistan Sikh militants from the Golden Temple in Amritsar, Punjab.

S93. Ans.(c)
Sol. The Correct answer is (c) Netaji Subhas Chandra Bose
- Parakram Diwas, observed on January 23rd, 2024, marks the birth anniversary of Netaji Subhas Chandra Bose, a prominent figure in India's freedom struggle. This day is celebrated to honour his indomitable spirit and invaluable contribution to India's independence. This year nation observe the 127th edition of Parakram Diwas 2024.
- Parakram Diwas 2024 is a national event celebrated annually in India since 2021

S94. Ans.(a)
Sol. The correct answer is (a) Daniel Barenboim and Ali Abu Awwad.
Detail Explanation:
- The Indira Gandhi Prize for Peace, Disarmament, and Development for 2023 was awarded jointly to Daniel Barenboim and Ali Abu Awwad.
- Barenboim is a renowned conductor and pianist who has dedicated his work to promoting peace and understanding through music, particularly between Israelis and Palestinians.
- Awwad is a Palestinian peace activist and co-founder of the Nonviolent Resistance Movement, which advocates for nonviolent resistance against the Israeli occupation.
- They were recognized for their outstanding efforts in bringing together the youth and peoples of Israel and the Arab world through music, dialogue, and people's action, aimed at achieving a non-violent resolution of the Israel-Palestine conflict.

S95. Ans.(b)
Sol. The answer is (b) Vijay Amritraj and Leander Paes
Former doubles world No. 1 Leander Paes and broadcaster and promoter Vijay Amritraj of India have become the first Asian men to be inducted into the International Tennis Hall of Fame.
About Leander Paes:
- Leander Paes, an 18-time Grand Slam champion in doubles and mixed doubles, secures his place in the Player category. Renowned as one of the greatest doubles players in history, Paes achieved the No. 1 ranking in doubles and boasts an impressive tally of 8 doubles titles and 10 mixed doubles titles.
- Paes, a stalwart in prestigious events like the Olympics, Grand Slams, and Davis Cup for over three decades, clinched an Olympics Bronze in Singles in 1996

About Vijay Amritraj:
- Vijay Amritraj's career in tennis spanned over two decades, from the early 1970s to the late 1980s. During that time, he became one of the most successful Indian tennis players of all time.
- He reached the quarterfinals of the French Open in 1971 and the semifinals of Wimbledon in 1973. He also won several tournaments on the ATP Tour, including the Washington Star International in 1974 and the Los Angeles Open in 1975.

S96. Ans.(d)
Sol. The answer is (d)
Indian wrestler Antim Panghal has been named the Rising Star of the Year among women by the United World Wrestling (UWW), the sport's global governing body. The 19-year-old dynamo, competing in the 53 kg category, has had a remarkable season that has not only garnered accolades but has also overshadowed senior stalwart Vinesh Phogat in the same weight class.

S97. Ans.(b)
Sol. The answer is (b), Savita Ladage.
- The Royal Society of Chemistry's Nyholm Prize for Education for 2023 was awarded to Professor Savita Ladage. Professor Ladage, based at the Homi Bhabha Centre for Science Education, Tata Institute of Fundamental Research in Mumbai, received this prestigious award for her significant contributions to chemistry education.
- Her work includes mentoring chemistry educators and initiating various teacher and student programs aimed at promoting chemistry education in India.
- In addition to the recognition, Professor Ladage received a prize of £5000, a medal, and a certificate.
- The Nyholm Prize for Education is a part of the Excellence in Education Prizes by the Royal Society of Chemistry, which honors individuals working across different levels of education in the chemical sciences, including teachers and technicians.

S98. Ans.(a)
Sol. The massacre of British men, women, and children at Cawnpore (Kanpur) during the Revolt of 1857 was led by option (a) Nana Sahib.

Nana Sahib, also known as Rani Nana, was one of the prominent leaders of the Indian Rebellion of 1857 (also known as the Indian Mutiny or Sepoy Mutiny). He was the adopted son of the last Peshwa of the Maratha Empire, Baji Rao II. After the annexation of the Maratha territories by the British, Nana Sahib's pension was stopped, which fueled his resentment against the British.

During the uprising, Nana Sahib and his forces captured British civilians and soldiers, including women and children, and held them hostage in the city of Cawnpore (now Kanpur). However, after a tense stand-off and negotiations, the hostages were eventually killed in a brutal massacre. The incident at Cawnpore became one of the significant and tragic events of the Indian Rebellion of 1857.

S99. Ans.(b)
Sol. When the offices of the President and Vice-President of India fall vacant simultaneously, the Chief Justice of India acts as the President. This provision is outlined in Article 65(1) of the Constitution of India. The Chief Justice of India assumes the responsibilities of the President until a newly elected President takes office.

S100. Ans.(c)
Sol. An assembler is a type of computer program that interprets software programs written in assembly language into machine language, code and instructions that can be executed by a computer.