

RRB ALP Free Mock

Q1. Simplify:

$$5x + 9\{x^2 \div (15x \div 45)\} - 5\{2\frac{1}{5} - x^3 \div (5x^2 \div x)\}$$

- (a) $2x^2 + 25x - 11$
- (b) $x^2 + 32x - 11$
- (c) $x^2 + 25x - 11$
- (d) $2x^2 + 31x - 11$

Q2. A hemispherical bowl with inner radius 7 cm is 0.35 cm thick. Find the bowl's outer curved surface area.

- (a) 289 cm^2
- (b) 337.85 cm^2
- (c) 338 cm^2
- (d) 339.57 cm^2

Q3. During the first year of a business, the revenue was ₹8,50,000. In the second year, the revenue increased by 25%. In the third year, the revenue decreased by 15% compared to the second year. What was the final revenue at the end of the third year? Express your answer in rupees.

- (a) 9,03,125
- (b) 8,36,258
- (c) 9,25,825
- (d) 8,95,855

Q4.

The value of $\frac{\{(p-2q)^2 + (2q-3r)^2 + (3r-p)^2\}}{6(p-2q)(2q-3r)(3r-p)}$, where $p \neq 2q$

- (a) $1/2$
- (b) 0
- (c) $1/4$
- (d) 1

Q5. In a mall, a discount of 10% is being provided. If the bill after discount is still more than 5000, then an additional discount of 5% is provided. What would a customer pay to the mall if he buys 6 items each of Rs. 1000.

- (a) Rs. 5400
- (b) Rs. 6000
- (c) Rs. 5130
- (d) Rs. 5250

Q6. Two filling pipes A and B can fill a tank in 12 min and 15 min respectively, while a third pipe C can empty it in 20 min when filled. If the tank is empty and pipes A and B are opened alternatively starting from pipe B while pipe C is opened all the time, in how much time will the tank be full?

- (a) 8 min
- (b) 12 min
- (c) 16 min
- (d) 40 min

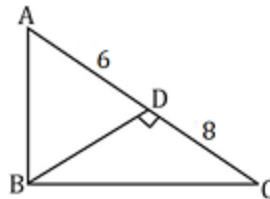
Q7. Excluding stoppages, the speed of a car is 96 km/h and including stoppages it is 72 km/h. What is the stoppage time of the car (in min)?

- (a) 15 min
- (b) 18 min
- (c) 10 min
- (d) 12 min

Q8. If $x - \frac{1}{x} = 2\sqrt{2}$, then find $x^4 + \frac{1}{x^4}$

- (a) 68
- (b) 98
- (c) 102
- (d) 64

Q9. ΔABC is a right-angled triangle, $BD \perp AC$. If $AD = 6$ cm and $DC = 8$ cm, then half of $BD = ?$



- (a) $4\sqrt{3}$ cm
- (b) $2\sqrt{3}$ cm
- (c) 4 cm
- (d) 6 cm

Q10.

Find value of $8 \div \frac{1}{8}$ of $\left[72 - \left\{64 \text{ of } \frac{1}{8} \times \left(\frac{3}{5} \div \frac{9}{25} \text{ of } \frac{5}{3}\right)\right\}\right]$

- (a) 21
- (b) 1
- (c) 0
- (d) -21

Q11. Study the following table and answer the question below.

School name	Total number of students enrolled	Percentage of enrolled students, opted Biology	Ratio of male to female students who opted Biology
A	900	30	7 : 8
B	400	36	5 : 7
C	1000	24	5 : 19
D	800	18	3 : 9

Find the ratio of the number of female students who opted biology in school B with the females who opted biology in school D.

- (a) 7 : 9
- (b) 9 : 7
- (c) 3 : 5
- (d) 5 : 3

Q12. The Average age of a class of 43 students is 18 years. The average decreased by 1 when the teacher's age also excluded. What is the age of the teacher (in years)?

- (a) 40
- (b) 50
- (c) 70
- (d) 60

Q13. The sum of two numbers is four times the difference between them. If the smaller number is 24, find the bigger number.

- (a) 50
- (b) 40
- (c) 60
- (d) 80

Q14. Sales of a shop are Rs. 10760, Rs 11850, Rs 11980, Rs 12110 and Rs 12230 for 5 months. What should be the sales in 6th month so that the average will be Rs 12000?

- (a) Rs 12560
- (b) Rs 12780
- (c) Rs 13070
- (d) Rs 12990

Q15. What is 40% of 30% of Rs. 1500?

- (a) Rs 250
- (b) Rs 180
- (c) Rs 275
- (d) Rs 210

Q16.

If a man travels at $1/x^3$ km/h on a journey and returns at $1/x^2$ km/h, then his average speed for the journey is:

- (a) $1/(x^2 + x^3)$
- (b) $2/(x^2 + x^3)$
- (c) $(x^2 + x^3)/2$
- (d) $(x^2 + x^3)/2x$

Q17. In a linear race of 1000 m, A beats B by 200 m or 40 seconds. What is the difference between the speeds (in m/s) of A and B?

- (a) 2/3
- (b) 9/8
- (c) 5/4
- (d) 8/9

Q18.

What will be the remainder when $29^{29} + 29$ is divisible by 30?

- (a) 27
- (b) 28
- (c) 26
- (d) 25

Q19. Calculate the HCF of $\frac{4}{7}, \frac{8}{9}, \frac{4}{3}$.

- (a) 4/63
- (b) 2/15
- (c) 4/60
- (d) 3/65

Q20.

If $z + \frac{1}{z} = 5$, then what is the value of $\frac{1}{z^8} + z^3 + 4$?

- (a) 114
- (b) 105
- (c) 100
- (d) 129

Q21. In the following question, select the related number pair from the given alternatives.

79 : 96 :: ? : ?

- (a) 69 : 97
- (b) 114 : 131
- (c) 93 : 112
- (d) 122 : 143

Q22. In the following question, select the odd word from the given alternatives.

- (a) West Bengal
- (b) Chandigarh
- (c) Kolkata
- (d) Lucknow

Q23. Three of the following four numbers are alike in a certain way and one is different. Pick the number that is different from the rest.

- (a) 510
- (b) 1726
- (c) 2194
- (d) 2742

Q24. In the following question, select the odd letter/letters from the given alternatives.

- (a) GEHD
- (b) NLOK
- (c) OMPL
- (d) YWAV

Q25. In the following question, select the missing number from the given series.

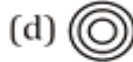
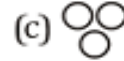
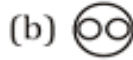
4, 5, 7, 16, 28, 51, 95, ?

- (a) 145
- (b) 182
- (c) 174
- (d) 172

Q26. Select the set in which the numbers are related in the same way as are the number of following set.

- (5, 12, 20)
- (a) (3, 9, 16)
- (b) (7, 16, 28)
- (c) (1, 2, 4)
- (d) (4, 10, 18)

Q27. Which of the following Venn diagram best represents the relationship between Football, Player and Field?



- (a) a
- (b) b
- (c) c
- (d) d

Q28. 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.

I. All man is father.

II. All fathers are son.

Conclusion.

I. Some fathers are son.

II. No son is man.

- (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

Q29. Which answer figure will complete the pattern in the question figure?



(a)



(b)



(c)



(d)



Q30. In a certain code language, '-' represents '+', '+' represents 'x', 'x' represents '÷' and '÷' represents '-'. Find out the answer to the following question.

$$12 + 38 \times 19 \div 14 - 6 = ?$$

- (a) 48
- (b) 24
- (c) 30
- (d) 16

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

BNSQ, BEAG, BVIW, BMQM, _____

- (a) BDAC
- (b) BDYC
- (c) BDYJ
- (d) ADAV

Q32. Select the option that is related to the third word in the same way as the second word is related to the first word. (The words must be considered as meaningful English words and must not be related to each other based on the number of letters/number of consonants/vowels in the word).

DOG: BARK :: DOLPHIN: ?

- (a) CLICK
- (b) DRUM
- (c) GRUNT
- (d) BELLOW

Q33. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

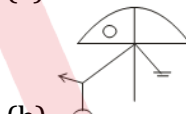
15 : 197 :: 24 : 530 :: 9 : ?

- (a) 66
- (b) 65
- (c) 67
- (d) 78

Q34. If $A \times B$ means that A is the brother of B, $A - B$ means that A is the sister of B, $A + B$ means that A is the father of B, $A * B$ means that A is the mother of B, then which of the following expression shows that E is the paternal grandmother of D?

- (a) $F - E + C + A - B \times D$
- (b) $F + E * C \times A \times B + D$
- (c) $E + C - A \times F * B + D$
- (d) $F * E + C - A + B \times D$

Q35. Select the correct mirror image of the given figure when the mirror is placed to the right of the figure.



Q36. In the following question, select the missing number from the given series.

12, 29, 63, 114, 182, ?

- (a) 274
- (b) 267
- (c) 256
- (d) 236

Q37. Select the correct combination of mathematical signs to sequentially replace the * signs and to balance the given equation.

$$35 * 7 * 5 * 15 * 55$$

- (a) -, ×, =, +
- (b) +, ×, =, -
- (c) -, ×, +, =
- (d) +, ×, -, =

Q38. Select the option that is related to the third term in the same way as the second term is related to the first term and the sixth term is related to the fifth term.

22 : 510 :: 25 : ? :: 32 : 1060

- (a) 720
- (b) 650
- (c) 654
- (d) 620

Q39. Select the option that is related to the third term in the same way as the second term is related to first.

Hill: Ant :: Kennel: ?

- (a) Lion
- (b) Horse
- (c) Dog
- (d) Camel

Q40. Two position of a dice is shown below. Which of the following is opposite to 'M'?



- (a) P
- (b) Q
- (c) M
- (d) S

Q41. Heena runs 40 m towards East and turns to right, runs 20 m and turns to right, runs 10 m and again turns to left, runs 10 m and turns to left, runs 15 m and finally turns to left and runs 8 m. Now, which direction is she facing?

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

Q42. Assertion (A): The Indian Constitution is the longest written constitution in the world.

Reason (R): The Indian Constitution has borrowed provisions from various other constitutions.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q43. Assertion (A): Salt dissolves faster in hot water than in cold water.

Reason (R): The molecules in hot water move faster than those in cold water.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

Q44. In a group of boys, Alex is taller than Charlie but shorter than Ben. Eddie is shorter than Charlie but taller than Dave. Who is the second tallest?

- (a) Ben
- (b) Alex
- (c) Charlie
- (d) Eddie

Q45. Read the given statement and conclusions carefully and decide which of the conclusions logically follow(s) from the statement.

Statement: The school cafeteria has introduced a new salad bar option for lunch.

Assumption I: Students are increasingly interested in healthy eating options.

Assumption II: Adding a salad bar will increase cafeteria revenue.

Which of the following is true?

- (a) Only Assumption I is implicit.
- (b) Only Assumption II is implicit.
- (c) Both Assumption I and Assumption II are implicit.
- (d) Neither Assumption I nor Assumption II is implicit.

Q46. The value of acceleration due to gravity (g) at a distance of 2R from the surface of earth, where R is the radius of earth is _____.

- (a) g/3
- (b) g/4
- (c) g/9
- (d) g/2

Q47. If the Distance-Time graph is a curve then it represents _____.

- (a) uniform speed
- (b) constant displacement
- (c) uniform-non
- (d) non-uniform speed

Q48. What is the power rating (in W) of a bulb if a current of 0.1A passes through on application of 250V of potential difference across its terminals?

- (a) 2500
- (b) 50
- (c) 25
- (d) 1250

Q49. Which of the following equations correctly represents the kinetic energy of an object?

- (a) $E = mgh$. This equation represents the potential energy of an object.
- (b) $E = \frac{1}{2}mv^2$ This equation correctly represents the kinetic energy of an object.
- (c) $E = P/t$. This equation represents the power of an object.
- (d) $E = Fd$. This equation represents the work done by an object.

Q50. The phenomenon of an increase in the apparent frequency of sound as the source approaches the observer is called:

- (a) Reflection
- (b) Diffraction
- (c) Refraction
- (d) Doppler effect

Q51. Which type of mirror is used to create an enlarged, virtual image?

- (a) Concave mirror
- (b) Convex mirror
- (c) Plane mirror
- (d) None of the above

Q52. "Curie" is the unit of -

- (a) Radioactivity
- (b) Temperature
- (c) Heat
- (d) Energy

Q53. Which type of energy is converted to Kinetic Energy when an object falls?

- (a) Thermal Energy
- (b) Potential Energy
- (c) Chemical Energy
- (d) Nuclear Energy

Q54. Spherical form of raindrop is due to-

- (a) Density of liquid
- (b) Surface tension
- (c) Atmospheric pressure
- (d) Gravitational force

Q55. Which base is commonly used in soap making?

- (a) Sodium hydroxide
- (b) Potassium hydroxide
- (c) Calcium hydroxide
- (d) Magnesium hydroxide

Q56. What was Thomson's atomic model called?

- (a) Planetary Model
- (b) The plum pudding model
- (c) Quantum Mechanical Model
- (d) Solar System Model

Q57. Which organic compound is responsible for the characteristic smell of garlic?

- (a) Ethanol
- (b) Ethanoic acid
- (c) Allicin
- (d) Benzaldehyde

Q58. Which of the following is not an example of oxidation?

- (a) Burning of coal
- (b) Rusting of iron
- (c) Rancidity
- (d) Opening of Soda Bottle

Q59. Which series of elements is filled with electrons in the 4f orbitals in the sixth period?

- (a) 3d transition series
- (b) 4d transition series
- (c) Lanthanoid series
- (d) Actinoid series

Q60. Potassium is more metallic than sodium because

- (a) both have 1 electron in their outermost shell.
- (b) both are highly electropositive.
- (c) sodium is larger in size than potassium.
- (d) potassium is larger in size than sodium.

Q61. In which of the following part of the Neuron the information is transmitted in the chemical form?

- (a) Dendrite
- (b) Cell body
- (c) Axon
- (d) No option is correct

Q62. What type of blood does the right side of the heart pump?

- (a) Oxygenated blood
- (b) Deoxygenated blood
- (c) Plasma
- (d) None of the above

Q63. In which part of the cell would you most likely find the enzyme ATP synthase?

- (a) Nucleus
- (b) Mitochondria
- (c) Ribosome
- (d) Golgi apparatus

Q64. Gametophytic and Sporophytic Phases are Independent in

- (a) Pteridophytes
- (b) Bryophytes
- (c) Gymnosperms
- (d) Phaeophytes

Q65. Which organizations are behind the creation of the "Space on Wheels" initiative?

- (a) Indian Ministry of Health and WHO
- (b) SpaceX and NASA
- (c) Indian Space Research Organization (ISRO) and Vijnana Bharati (VIBHA)
- (d) Indian Railways and UNESCO

Q66. Who provided the name 'Midhili' to the cyclonic storm?

- (a) India
- (b) Sri Lanka
- (c) Maldives
- (d) Bangladesh

Q67. Which country has withdrawn from China's ambitious belt and road infrastructure initiative (BRI), a significant trade and infrastructure project?

- (a) Pakistan
- (b) Iran
- (c) Italy
- (d) Nepal

Q68. Who presented the coffee table book titled "Srirangam - The Resplendent Kingdom of Rangaraja" to Prime Minister Modi?

- (a) The Hindu Group of Publications
- (b) Sri Ranganathaswamy Temple authorities
- (c) BJP State President K. Annamalai
- (d) Tiruchi International Airport officials

Q69. In which state did Siddaramaiah launch the 'Yuva Nidhi' scheme for unemployed youth?

- (a) Maharashtra
- (b) Karnataka
- (c) Telangana
- (d) Tamil Nadu

Q70. In which session of the Indian National Congress did the historic union of Congress and the Muslim league take place?

- (a) Surat
- (b) Bombay
- (c) Calcutta
- (d) Lucknow

Q71. Who was the founder-editor of the famous newspaper Kesari during the National struggle?

- (a) Mahatma Gandhi
- (b) Jawaharlal Nehru
- (c) Lokmanya Tilak
- (d) Muhammad Iqbal

Q72. Fundamental rights are provided in which Part of the Constitution of India?

- (a) Part II
- (b) Part IV
- (c) Part III
- (d) Part V

Q73. Which of the following islands is not part of the Lakshadweep group?

- (a) Minicoy Island
- (b) Kavaratti Island
- (c) Androth Island
- (d) Havelock Island

Q74. Where is the headquarters of the International Fund for Agricultural Development (IFAD) located?

- (a) London, United Kingdom
- (b) Rome, Italy
- (c) New York City, United States
- (d) Geneva, Switzerland

Q75. Which joint military exercise does India conduct with Kazakhstan?

- (a) Exercise Nomadic Elephant
- (b) Exercise Indra
- (c) Exercise Shakti
- (d) Exercise Prabal Dostyk

Solutions

S1. Ans.(b)

Sol.

$$\begin{aligned}
 & 5x + 9 \{x^2 \div (15x \div 45)\} - 5 \left\{ 2\frac{1}{5} - x^3 \div (5x^2 \div x) \right\} \\
 & = 5x + 9 \left(x^2 \div \frac{x}{3} \right) - 5 \left\{ \frac{11}{5} - \frac{x^3}{5x} \right\} \\
 & = 5x + 9 \times 3x - 11 + x^2 \\
 & = 5x + 27x - 11 + x^2 \\
 & = x^2 + 32x - 11
 \end{aligned}$$

S2. Ans.(d)

Sol.

$$\begin{aligned}
 r & = 7 \text{ cm} \\
 R & = 7 + 0.35 \text{ cm} = 7.35 \text{ cm} \\
 \text{Curved surface area} & = 2\pi R^2 \\
 & = 2 \times \frac{22}{7} \times 7.35 \times 7.35 = 2 \times 22 \times 1.05 \times 7.35 \text{ cm}^2 \\
 & = 339.57 \text{ cm}^2
 \end{aligned}$$

S3. Ans.(a)

Sol.

$$\begin{aligned}
 \text{Revenue in First year} & = \text{Rs. } 8,50,000 \\
 \text{Revenue in 2}^{\text{nd}} \text{ year} & = \frac{5}{4} \times 8,50,000 \\
 \text{Revenue in 3}^{\text{rd}} \text{ year} & = \frac{17}{20} \times \frac{5}{4} \times 8,50,000 \\
 & = \text{Rs. } 9,03,125
 \end{aligned}$$

S4. Ans.(a)

Sol.

$$\begin{aligned}
 \text{Let } a & = p - 2q, b = 2q - 3r \text{ and } c = 3r - p \\
 a + b + c & = p - 2q + 2q - 3r + 3r - p = 0 \\
 \text{If } a + b + c & = 0, \text{ then } a^3 + b^3 + c^3 = 3abc \\
 \text{So, } \frac{a^3 + b^3 + c^3}{6abc} & = \frac{3abc}{6abc} = \frac{1}{2}
 \end{aligned}$$

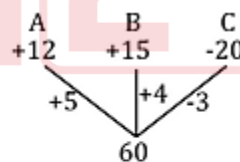
S5. Ans.(c)

Sol.

$$\begin{aligned}
 \text{Cost of 6 items} & = \text{Rs. } 6000 \\
 \text{Bill after first discount} & = \frac{9}{10} \times 6000 \\
 & = \text{Rs. } 5400 \\
 \text{Bill after 2}^{\text{nd}} \text{ discount} & = \frac{19}{20} \times 5400 \\
 & = 19 \times 270 \\
 & = \text{Rs. } 5,130
 \end{aligned}$$

S6. Ans.(d)

Sol.



$$\begin{aligned}
 \text{Work done in first 2 min} & = (B + C) + (A + C) \\
 & = (4 - 3) + (5 - 3) = 3 \text{ unit} \\
 \text{Then, time required to fill the tank} & = \frac{60 \times 2}{3} = 40 \text{ min.}
 \end{aligned}$$

S7. Ans.(a)

Sol.

$$\begin{aligned}
 \text{Stoppage time} & = \left(\frac{96-72}{96} \right) \times 60 \\
 & = \left(\frac{24}{96} \right) \times 60 = 15 \text{ min}
 \end{aligned}$$

S8. Ans.(b)**Sol.**

$$x - \frac{1}{x} = 2\sqrt{2}$$

$$x^2 + \frac{1}{x^2} = (2\sqrt{2})^2 + 2$$

$$x^2 + \frac{1}{x^2} = 10$$

$$x^4 + \frac{1}{x^4} = (10)^2 - 2$$

$$x^4 + \frac{1}{x^4} = 98$$

S9. Ans.(b)**Sol.**

We know that in a right-angled triangle where $BD \perp AC$

$$BD^2 = AD \times DC$$

$$BD^2 = 6 \times 8$$

$$BD^2 = 48$$

$$BD = 4\sqrt{3} \text{ cm}$$

$$\text{Then half of } BD = 2\sqrt{3} \text{ cm}$$

S10. Ans.(b)**Sol.**

$$\Rightarrow 8 \div \frac{1}{8} \text{ of } \left[72 - \left\{ 64 \text{ of } \frac{1}{8} \times \left(\frac{3}{5} \times \frac{5}{3} \right) \right\} \right]$$

$$\Rightarrow 8 \div \frac{1}{8} \text{ of } \left[72 - \left\{ 64 \times \frac{1}{8} \times 1 \right\} \right]$$

$$\Rightarrow 8 \div \frac{1}{8} \text{ of } [72 - 8]$$

$$\Rightarrow 8 \div 8 = 1$$

S11. Ans.(a)**Sol.**

$$\text{In School B no. of female who opted biology} = 400 \times \frac{36}{100} \times \frac{7}{12}$$

$$\text{School D no. of female who opted biology} = 800 \times \frac{18}{100} \times \frac{9}{12}$$

$$400 \times \frac{36}{100} \times \frac{7}{12} : 800 \times \frac{18}{100} \times \frac{9}{12}$$

$$= 7 : 9$$

S12. Ans.(d)**Sol.** Total age of all students = 43×18 years

Total age of all students - age of the teacher

$$= 42 \times 17 \text{ years}$$

$$\text{Age of the teacher} = 43 \times 18 - 42 \times 17 = 60 \text{ years}$$

S13. Ans.(b)**Sol.** Ratio between sum and difference of the number is 4 : 1

$$\text{So, ratio between the number} = (4 + 1) : (4 - 1)$$

$$= 5 : 3$$

The smaller number is 3 unit = 24

$$1 \text{ unit} = 8$$

$$\text{Bigger number} = 5 \times 8 = 40$$

S14. Ans.(c)

$$\begin{aligned} \text{Sol. Sales of 6th month} &= 12000 \times 6 - (10760 + \\ &11850 + 11980 + 12110 + 12230) \\ &= 13070 \end{aligned}$$

S15. Ans.(b)**Sol.**

$$\frac{40}{100} \times \frac{30}{100} \times 1500 = \text{Rs. } 180$$

S16. Ans.(b)**Sol.**

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\frac{1}{x^3} = \frac{D}{T_1}$$

$$T_1 = Dx^3$$

For return journey,

$$\frac{1}{x^2} = \frac{D}{T_2}$$

$$T_2 = Dx^2$$

$$\text{Average Speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{D+D}{Dx^3+Dx^2} = \frac{2}{x^3+x^2} \text{ km/h}$$

Alternative method:

$$\text{Average} = \frac{2xy}{x+y} = \frac{2 \times \frac{1}{x^3} \times \frac{1}{x^2}}{\frac{1}{x^3} + \frac{1}{x^2}} = \frac{2}{x^3+x^2}$$

S17. Ans.(c)**Sol.**

$$\text{Speed of B} = \frac{200}{40} = 5 \text{ m/s}$$

$$\text{Time taken by B} = \frac{1000 \text{ m}}{5 \text{ m/s}} = 200 \text{ seconds}$$

$$\text{Time taken by A} = 200 - 40 = 160 \text{ seconds}$$

$$\text{Speed of A} = \frac{1000}{160} = \frac{25}{4} \text{ m/s}$$

$$\text{required difference} = \frac{25}{4} - 5$$

$$= \frac{10}{8} = \frac{5}{4} \text{ m/sec}$$

S18. Ans.(b)**Sol.** $A^n + B^n$ is divisible by $(A + B)$ when n is odd.

$$(29^{29} + 29) = (29^{29} + 1 + 29 - 1)$$

$$= (29^{29} + 1^{29}) + 28$$

$$(29^{29} + 1^{29}) \text{ will be divisible by } (29 + 1) = 30$$

So, $(29^{29} + 29)$ when divided by 30, gives remainder 28.

S19. Ans.(a)

Sol.

$$\begin{aligned} \text{HCF of fraction} &= \frac{\text{HCF of } (4,8,4)}{\text{LCM of } (7,9,3)} \\ &= \frac{4}{63} \end{aligned}$$

S20. Ans.(a)

Sol.

$$\begin{aligned} z + \frac{1}{z} &= 5 \\ \Rightarrow \left(z + \frac{1}{z}\right)^2 &= 25 \\ \Rightarrow z^2 + \frac{1}{z^2} + 2 &= 25 \\ \Rightarrow z^2 + \frac{1}{z^2} &= 23 \\ = \left(z + \frac{1}{z}\right) \left(z^2 + \frac{1}{z^2}\right) &= 5 \times 23 = 115 \\ = \frac{1}{z^3} + z^3 + z + \frac{1}{z} &= 115 \\ = \frac{1}{z^3} + z^3 &= 115 - 5 = 110 \\ \frac{1}{z^3} + z^3 + 4 &= 110 + 4 = 114 \end{aligned}$$

S21. Ans.(b)

Sol. The pattern is

$$\begin{aligned} 96 - 79 &= 17 \\ 131 - 114 &= 17 \end{aligned}$$

S22. Ans.(a)

Sol. The logic here is

All are capitals except (a).

S23. Ans.(c)

Sol. except 'c' all are the cube of numbers and then subtract 2.

$$\begin{aligned} 8^3 - 2 &= 510 \\ 12^3 - 2 &= 1726 \\ 13^3 - 2 &= 2197 - 2 = 2195 \neq 2194 \\ 14^3 - 2 &= 2742 \end{aligned}$$

S24. Ans.(d)

Sol. Except YWAV, rest all three are -2, +3, -4 series

S25. Ans.(c)

Sol. The pattern followed here is

$$\begin{aligned} 16 &= 4 + 5 + 7, \\ 28 &= 5 + 7 + 16 \\ 51 &= 7 + 16 + 28, \\ 95 &= 16 + 28 + 51 \\ 174 &= 28 + 51 + 95 \end{aligned}$$

S26. Ans.(b)

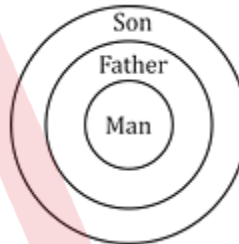
Sol. $(5, 12, 20) = 5 \times 2 + 2 = 12, 12 \times 2 - 4 = 20$
Similarly, $(7, 16, 28) = 7 \times 2 + 2 = 16, 16 \times 2 - 4 = 28$

S27. Ans.(c)

Sol. Football, players and field all are different.

S28. Ans.(a)

Sol.



- I. ✓
- II. ✗

Only conclusion I follows.

S29. Ans.(a)

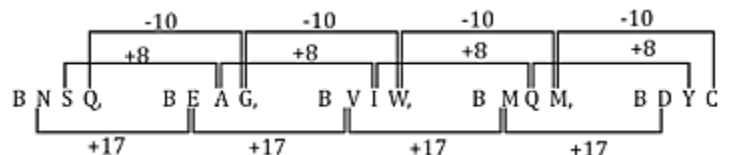
S30. Ans.(d)

Sol.

$$\begin{aligned} 12 \times 38 \div 19 - 14 + 6 \\ \Rightarrow 12 \times 2 - 14 + 6 \\ \Rightarrow 24 - 14 + 6 \\ \Rightarrow 16 \end{aligned}$$

S31. Ans.(b)

Sol.



S32. Ans.(a)

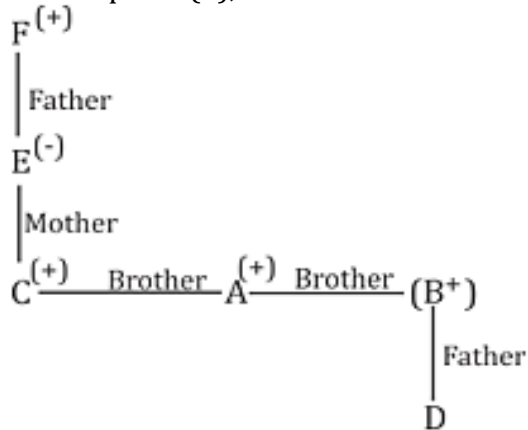
Sol. Animal and sound relation is used.

S33. Ans.(b)

Sol. Second number = (First number - 1)² + 1

S34. Ans.(b)

Sol. In option (b), F + E* C × A × B + D



S35. Ans.(b)

S36. Ans.(b)

Sol.

The pattern is

$$12, \underbrace{29}_{+17}, \underbrace{63}_{+34}, \underbrace{114}_{+51}, \underbrace{182}_{+68}, \underbrace{?}_{+85}$$

$? \Rightarrow 182 + 85 = 267$

S37. Ans.(d)

Sol.

$$35 * 7 * 5 * 15 * 55$$

From options:

(d). $35 + 7 \times 5 - 15 = 55$
 $\Rightarrow 35 + 35 - 15 = 55$
 $\Rightarrow 55 = 55 \rightarrow$ correct

S38. Ans.(c)

Sol.

$$22: 510 \Rightarrow 22 \times 23 + 4 = 510$$

$$32 : 1060 \Rightarrow 32 \times 33 + 4 = 1060$$

Similarly,

$$25 : ? \Rightarrow 25 \times 26 + 4 = 654$$

S39. Ans.(c)

Sol. Places where animal lives.

Dog lives in Kennel.

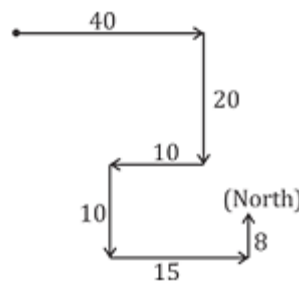
S40. Ans.(b)

Sol.



S41. Ans.(a)

Sol.



S42. Ans.(b).

Sol. Both A and R are true, but R is not the correct explanation of A. The length of the Indian Constitution is due to its detailed provisions, not just because it has borrowed provisions from various constitutions.

S43. Ans.(a).

Sol. Both A and R are true and R is the correct explanation of A. The increased kinetic energy of the water molecules in hot water allows them to dissolve salt faster.

S44. Ans.(b)

Sol. The sequence is:

Ben > Alex > Charlie > Eddie > Dave

S45. Ans.(a)

Sol. let's examine each assumption in the context of the statement:

- **Assumption I - Interest in Healthy Eating:** This assumption might be considered implicit because the introduction of a salad bar could be seen as a response to students' interest in healthier eating options. It's reasonable to assume that the cafeteria would introduce options that align with the interests and demands of the students.
- **Assumption II - Increase in Revenue:** This assumption is more speculative and business-oriented. The introduction of a salad bar could be aimed at increasing revenue, but it's not a direct or necessary implication of the statement. The primary purpose could be to offer healthier options, comply with dietary guidelines, or respond to feedback, rather than directly aiming to increase revenue.

Given these considerations, the most appropriate conclusion would be:

(a) Only Assumption I is implicit.

This answer reflects the likely rationale behind the introduction of a new salad bar option, focusing more on responding to a trend or demand (healthy eating) rather than a direct financial motive.

S46. Ans.(c)

Sol. The formula for acceleration due to gravity above the surface of earth is given by:

$$g' = g * R^2 / (R + h)^2$$

where:

- g' is the acceleration due to gravity at height h above the surface of earth
- g is the acceleration due to gravity at the surface of earth
- R is the radius of earth
- h is the height above the surface of earth

In this case, $h = 2R$, so we have:

$$g' = g * R^2 / (R + 2R)^2 = g * R^2 / 9R^2 = g / 9$$

Therefore, the value of acceleration due to gravity at a distance of $2R$ from the surface of earth is $g/9$. So the answer is (c)

S47. Ans.(d)

Sol. If the Distance-Time graph is a curve then it represents non-uniform speed. The slope of distance-time graph represents its velocity

S48. Ans.(c)

Sol. Power law equation (formula): $P = I \times V$
 $= 0.1 \times 250 = 25 \text{ W}$.

S49. Ans.(b)

Sol. The answer is b). The equation $E = 1/2mv^2$ correctly represents the kinetic energy of an object. The mass of the object (m) is multiplied by half of the square of its velocity (v^2). The units of kinetic energy are Joules (J), which are equal to kilogram-meters squared per second squared ($\text{kg m}^2/\text{s}^2$).

The other equations represent:

- Potential energy: $E = mgh$, where m is the mass of the object, g is the acceleration due to gravity (9.8 m/s^2), and h is the height of the object.

- Power: $E = P/t$, where P is the power of the object and t is the time it takes to do the work.
- Work done by an object: $E = Fd$, where F is the force exerted by the object and d is the distance the object moves.

S50. Ans.(d)

Sol. The phenomenon of an increase in the apparent frequency of sound as the source approaches the observer is called the Doppler effect. So the answer is (d).

- Reflection is the bouncing of a wave off a surface. Diffraction is the bending of a wave as it passes through an opening or around an obstacle. Refraction is the bending of a wave as it passes from one medium to another.
- The Doppler effect is a phenomenon that occurs when there is a relative motion between a source of waves and an observer. The apparent frequency of the waves is different from the actual frequency of the waves due to the motion.
- In the case of sound waves, the apparent frequency of the sound is higher when the source is approaching the observer and lower when the source is moving away from the observer. This is because the sound waves are compressed when the source is approaching the observer, which increases the frequency of the waves.
- The Doppler effect can also be observed for light waves. In fact, the Doppler effect is used in radar to measure the speed of objects.

Additional details about the Doppler effect:

- The Doppler effect is named after Christian Doppler, an Austrian physicist who first described the phenomenon in 1842.
- The Doppler effect is a common phenomenon that can be observed in everyday life. For example, the sound of an ambulance siren gets higher as the ambulance approaches and lower as it moves away.
- The Doppler effect can also be used to measure the speed of objects. For example, radar uses the Doppler effect to measure the speed of airplanes and other objects.

S51. Ans.(a)

Sol. A concave mirror is used to create an enlarged, virtual image. A concave mirror has a reflecting surface that curves inward, causing light rays that strike the mirror to converge. When an object is placed in front of a concave mirror beyond its focal point, it forms an enlarged, virtual image. The image is virtual because the light rays do not actually converge at the location of the image but appear to originate from there when traced backward. This type of image is also larger than the object, making it appear magnified.

S52. Ans.(a)

Sol. The correct answer is (a) Radioactivity. Curie (Ci) is the unit of radioactivity. It is named after Marie Curie, a pioneering physicist and chemist who conducted groundbreaking research on radioactivity. The Curie is a unit of activity that measures the rate at which a radioactive substance undergoes decay or disintegration. It is equal to 3.7×10^{10} disintegrations per second, which is approximately the activity of one gram of radium-226. The other options, temperature, heat, and energy, are not measured in Curie.

S53. Ans.(b)

Sol. The correct answer is (b) Potential Energy. When an object falls, the potential energy it had due to its position above the ground or other surface is converted into kinetic energy. This happens because the object's potential energy decreases as it moves closer to the ground, and this decrease is accompanied by an increase in kinetic energy.

S54. Ans.(b)

Sol. The correct answer is (b) Surface tension. The spherical form of a raindrop is primarily due to surface tension. Surface tension is a phenomenon that occurs at the interface between two different substances, such as a liquid and a gas. In the case of raindrops, the surface tension of water molecules at the air-water interface causes the liquid to adopt a spherical shape. Surface tension is the result of cohesive forces between the water molecules, which tend to minimize the surface area of the liquid. In the absence of external forces, a raindrop will naturally

assume a spherical shape, as this shape minimizes the surface area for a given volume. This is because a sphere has the smallest surface area-to-volume ratio among all shapes.

S55. Ans.(a)

Sol. The correct answer is (a) Sodium hydroxide. Sodium hydroxide sometimes called caustic soda or lye, is a strong base that is commonly used in soap-making to react with fats and oils to form soap. Potassium hydroxide is also used in soap making, but it produces a softer soap than sodium hydroxide. Calcium hydroxide and magnesium hydroxide are bases that are used for other purposes, such as in agriculture or medicine.

S56. Ans.(b)

Sol. Thomson's atomic model was called the "plum pudding" model. It was proposed by J.J. Thomson in 1904, and it described the atom as a sphere of positive charge with negatively charged electrons embedded within it like plums in a pudding.

- The model was based on Thomson's discovery of the electron in 1897, which showed that atoms were not indivisible and that they contained smaller, negatively charged particles.
- The plum pudding model was later replaced by the nuclear model proposed by Rutherford in 1911, which showed that the positive charge of the atom was concentrated in a small, dense nucleus at the center of the atom, with electrons orbiting around it.
- The model is also sometimes referred to as the watermelon model.

S57. Ans.(c)

Sol. Allicin is a sulfur compound that is produced when garlic is crushed or chopped. It is responsible for the characteristic smell and taste of garlic. Ethanol, Ethanoic acid, and Benzaldehyde do not contribute to the characteristic smell of garlic. Ethanol is the alcohol present in alcoholic beverages, ethanoic acid is commonly known as acetic acid (the main component of vinegar), and benzaldehyde is an aromatic compound found in almonds and cherries, but none of these compounds are responsible for the specific smell associated with garlic.

Garlic: Garlic is a member of the onion family, and it is native to Central Asia. It has been used for centuries for its culinary and medicinal properties. Garlic is a good source of vitamins and minerals, including vitamin C, vitamin B₆, and manganese. It is also a good source of selenium, a mineral that is important for thyroid health. Allicin (Found in garlic) is also responsible for some of the health benefits of garlic, such as its ability to lower blood pressure and cholesterol levels.

S58. Ans.(d)

Sol. Oxidation is a chemical reaction that involves the loss of electrons. It is the opposite of reduction, which involves the gain of electrons.

The burning of coal is an example of oxidation because the carbon in the coal reacts with oxygen to form carbon dioxide. Rusting of iron is an example of oxidation because the iron reacts with oxygen to form iron oxide. Rancidity is an example of oxidation because the fats and oils in food react with oxygen to form aldehydes and ketones, which give food a rancid taste and smell.

Opening a soda bottle is not an example of oxidation because it does not involve the loss of electrons. When a soda bottle is opened, the carbon dioxide gas that was dissolved in the soda escapes into the air. This is a physical change, not a chemical change. Therefore, the opening of a soda bottle is not an example of oxidation.

S59. Ans.(c)

Sol. The Lanthanoid series is the series of elements filled with electrons in the 4f orbitals in the sixth period. This series begins with the element cerium (Z = 58) and ends with the element lutetium (Z = 71). The lanthanoid series is also known as the 4f-inner transition series, as the electrons are being filled into the inner 4f subshell. These elements are also called lanthanides and are part of the transition metals group.

- **3d transition series:** This series of elements refers to the transition metals that start filling up the 3d orbitals after the 4s orbital is filled. These elements are found in the fourth period of the periodic table, from scandium (Z = 21) to zinc (Z = 30).

- **4d transition series:** This series of elements refers to the transition metals that start filling up the 4d orbitals after the 5s orbital is filled. These elements are found in the fifth period of the periodic table, from yttrium (Z = 39) to cadmium (Z = 48).
- **Actinoid series:** This series of elements refers to the elements that fill up the 5f orbitals in the seventh period of the periodic table, from thorium (Z = 90) to lawrencium (Z = 103). These elements are also part of the f-block and are all radioactive.

S60. Ans.(d)

Sol. Potassium is more metallic than sodium because Potassium has one more energy level than sodium, which means it has a larger atomic radius. As a result, the valence electron in potassium is farther from the nucleus and experiences less attraction to the nucleus than the valence electron in sodium. This leads to lower ionization energy and electronegativity, making potassium more metallic than sodium.

S61. Ans.(a)

Sol. The correct answer is (a).

Information is transmitted in the chemical form in the dendrites of a neuron. The dendrites are the tree-like extensions of a neuron that receive signals from other neurons. When a signal is received by a dendrite, it causes the release of neurotransmitters. These neurotransmitters then travel across the synaptic cleft to the axon of the next neuron, where they bind to receptors and cause an electrical signal to be generated.

The cell body and axon of a neuron do not transmit information in the chemical form. The cell body contains the nucleus of the neuron, which is where the genetic material is located. The axon is the long, slender extension of a neuron that carries signals away from the cell body. Signals in the axon are transmitted in the electrical form.

So the answer is (a).

S62. Ans.(b)

Sol. The right side of the heart pumps deoxygenated blood. So the answer is (b).

The right side of the heart receives deoxygenated blood from the body through the superior vena cava and inferior vena cava. This blood then travels to the right ventricle, which pumps it to the lungs through the pulmonary artery. In the lungs, the blood picks up oxygen and releases carbon dioxide. The oxygenated blood then travels back to the heart through the pulmonary veins, and enters the left side of the heart. The left side of the heart then pumps the oxygenated blood to the rest of the body.

S63. Ans.(b)

Sol. The enzyme ATP synthase is found in the mitochondria. So the answer is (b).

- ATP synthase is a protein complex that uses the energy of a proton gradient to synthesize ATP. The proton gradient is generated by the electron transport chain, which is located in the inner mitochondrial membrane. ATP synthase is embedded in the inner mitochondrial membrane, and it is here that it catalyzes the synthesis of ATP.
- The nucleus, ribosome, and Golgi apparatus are not involved in the production of ATP. The nucleus contains the cell's DNA, the ribosomes are responsible for protein synthesis, and the Golgi apparatus is involved in the modification and packaging of proteins.

S64. Ans.(a)

Sol. The answer is (a) Pteridophytes.

- Pteridophytes are the only group of plants in which the gametophytic and sporophytic phases are independent. In other groups of plants, the gametophyte is either dependent on the sporophyte (bryophytes) or is completely enclosed within the sporophyte (gymnosperms and angiosperms).
- In pteridophytes, the gametophyte is a free-living, photosynthetic organism that can grow and reproduce independently of the sporophyte. The sporophyte is also a free-living organism, but it is much larger and more complex than the gametophyte. The sporophyte produces spores, which germinate to form new gametophytes.

- The independent gametophytic and sporophytic phases in pteridophytes are due to the fact that pteridophytes have evolved a vascular system. This vascular system allows the sporophyte to transport water and nutrients to the gametophyte, which allows the gametophyte to be independent of the sporophyte.
- Bryophytes, gymnosperms, and angiosperms do not have a vascular system, so the gametophyte is either dependent on the sporophyte or is completely enclosed within the sporophyte.

Here is a table summarizing the gametophytic and sporophytic phases in different groups of plants:

Group	Gametophyte	Sporophyte
Pteridophytes	Free-living, photosynthetic	Free-living, larger and more complex
Bryophytes	Free-living, photosynthetic	Parasitic on the gametophyte
Gymnosperms	Enclosed within the sporophyte	Free-living
Angiosperms	Enclosed within the sporophyte	Free-living

S65. Ans.(c)

Sol. The answer is (c), Indian Space Research Organization (ISRO) and Vijnana Bharati (VIBHA). The "Space on Wheels" initiative is a mobile exhibition that aims to bring the wonders of space exploration to the doorstep of students and enthusiasts across India. It was launched by ISRO and VIBHA in 2023.

The exhibition features a variety of interactive exhibits on topics such as the solar system, stars and galaxies, and space technology. It also has a theater where visitors can watch educational films about space.

About ISRO:

- **Headquarters:** Bengaluru;
- **Founded:** 15 August 1969;
- **Founder:** Vikram Sarabhai;
- **Chairperson:** S. Somanath.

S66. Ans.(c)

Sol. The answer is (c) Maldives.

- The name "Midhili" was provided by Maldives, which is one of the countries that contributes names to cyclones that form in the Bay of Bengal and the Arabian Sea. The process of naming cyclones in this region is coordinated by the World Meteorological Organization (WMO), with a rotating list of names provided by the member countries.
- The naming of cyclones is important for several reasons. It helps to identify individual cyclones, which can be helpful in tracking their movement and issuing warnings. It also makes it easier for the public to remember and understand information about cyclones.

S67. Ans.(c)

Sol. The answer is (c) Italy.

- The country that has withdrawn from China's Belt and Road Initiative (BRI) is Italy. This decision was formally announced by the Italian government on December 6, 2023. Italy's withdrawal from the BRI, a significant trade and infrastructure project initiated by China, marks a notable shift in the country's foreign policy and international economic relations.
- Italy signed a Memorandum of Understanding (MOU) with China in 2019 to join the BRI, the only G7 nation to do so.
- The BRI, launched in 2013, aims to build infrastructure across land and sea to connect China with other countries, aiming to boost trade and economic growth.

S68. Ans.(c)

Sol. The coffee table book titled "Srirangam - The Resplendent Kingdom of Rangaraja" was presented to Prime Minister Modi by **(c) BJP State President K. Annamalai**.

The book "Srirangam - The Resplendent Kingdom of Rangaraja" is a comprehensive volume of 454 pages, detailing the marvels of the Sri Ranganathaswamy Temple. As the foremost among the 108 Divya Desams, this temple is a beacon of spiritual and architectural significance in India.

S69. Ans.(b)

Sol. Correct answer is (b) Karnataka

- Siddaramaiah launched the 'Yuva Nidhi' scheme for unemployed youth in the state of Karnataka
- The Yuva Nidhi scheme provides financial assistance to unemployed graduates and diploma holders in the state, offering ₹3,000 per month to graduates and ₹1,500 per month to diploma holders.
- The scheme aims to support young people while they seek employment and also encourage skill development through the Skill Connect portal.

S70. Ans.(d)

Sol. Lucknow Pact is an agreement made by the Indian National Congress headed by Maratha leader Bal Gangadhar Tilak and the All-India Muslim League led by Muhammad Ali Jinnah. The meeting at Lucknow marked the reunion of the moderate and radical wings of the Congress. The pact dealt both with the structure of the government of India and with the relation of the Hindu and Muslim communities.

S71. Ans.(c)

Sol. The correct answer is Lokmanya Tilak. Lokmanya Bal Gangadhar Tilak was an Indian nationalist, social reformer, and freedom fighter who played a significant role in the Indian independence movement. He founded and served as the editor of the famous Marathi-language newspaper called "Kesari" ("The Lion") during the national struggle. Kesari was established in 1881 and played a crucial role in awakening nationalistic sentiments among the Indian population.

S72. Ans.(c)

Sol. Fundamental rights are those rights which are essential for intellectual, moral and spiritual development of individuals. As these rights are fundamental or essential for existence and all-round development of individuals, hence, it's called as 'Fundamental rights'. These are enshrined in Part III (Articles 12 to 35) of the Constitution of India.

S73. Ans.(d)

Sol. The correct answer is (d) Havelock Island. Havelock Island is not part of the Lakshadweep group of islands. It is actually located in the Andaman and Nicobar Islands, which are a separate group of islands in the Bay of Bengal.

Option	Description
Minicoy Island	The southernmost island in the Lakshadweep group
Kavaratti Island	The administrative headquarters of the Lakshadweep group
Androth Island	The largest island in the Lakshadweep group
Havelock Island	Part of the Andaman and Nicobar Islands

S74. Ans.(b)

Sol. The correct answer is (b) Rome, Italy. The headquarters of the International Fund for Agricultural Development (IFAD) is located in Rome, Italy. IFAD is a specialized agency of the United Nations that works to address rural poverty

and promote sustainable agricultural development in developing countries. It was established in 1977, and its headquarters in Rome serves as the central hub for its operations and initiatives around the world.

S75. Ans.(d)

Sol. Exercise Prabal Dostyk is a joint military exercise conducted between the armed forces of India and Kazakhstan. The exercise aims to enhance cooperation and interoperability between the two countries' armed forces through joint training and exercises. It includes various components such as infantry, armor, and artillery units from both countries. The exercise provides an opportunity for the forces to learn from each other's experiences, share best practices, and strengthen their defense ties.

