All India Mock: RRB ALP 16th & 17th March 2024

Q1. The table given below shows the number of toys manufactured by five factories.

Factory	Toys
F1	250
F2	450
F3	350
F4	150
F5	550

Number of toys manufactured by F2 are what percent of the number of toys manufactured by F1?
(a) 200 percent
(b) 100 percent
(c) 180 percent
(d) 50 percent

Q2. Find the value of sin 15° sin 45° sin 75° sin 30°.
(a) 2
(b) $\frac{1}{8\sqrt{2}}$
(c) $\frac{1}{16}$
(d) 0

Q3. Find smallest number which when divided successively by 7, 6 and 3 leave remainder 5, 3 and 2.
(a) 106
(b) 110
(c) 108
(d) 105

Q4. If (a + b) : (b + c) : (c + a) = 4 : 9 : 7 and 3a + 4b + 7c = 399, then the value of c will be.
(a) 49
(b) 35
(c) 38
(d) 42

Q5. If ax - 5y = -9 has a slope of -7/5. What is the value of a?
(a) 8
(b) 7
(c) −8
(d) −7

Q6. Number p is 80% more than 120. If k is 40% less than p, find k.
(a) 100
(b) 108.6
(c) 129.6
(d) 118

Q7. What is the ratio of fourth proportion of 3,6,12 to the fourth proportion of 7,6,14.
(a) 1:2
(b) 2:1
(c) 1:3
(d) 3:1

Q8. A Shopkeeper earns 15% on an investment but loses 10% on another investment. The ratio of both investments is 4:5, then the combined loss or profit percentage is:

(a) $2\frac{1}{3}\%$

(b) $\frac{1}{3}\%$

(c) $2\frac{1}{9}\%$

(d) $1\frac{1}{9}\%$

Q9. If the diameter of a solid hemisphere is 16.8 cm, find its volume.
(a) 1600 cm^3
(b) 1528.324 cm^3
(c) 1241.856 cm^3
(d) 1452.256 cm^3

Q10. The height of an equilateral triangle is $15\sqrt{3}$ cm. What is the area of this equilateral triangle (in cm^2)?
(a) $196\sqrt{3}$
(b) $15\sqrt{3}$
(c) $225\sqrt{3}$
(d) $64\sqrt{3}$

Q11. There is 40 L of mixture in a vessel which contains 25% of banana juice and rest is water. If 20L of water be mixed in it, the percentage of banana juice in the mixture is:
(a) 16.66%
(b) 26.26%
(c) 15.40%
(d) 23.63%

Q12. A man was going to Shimla but due to some problem in his vehicle. He had to walk at 75% of his usual speed, and he reached on its destination 1.5 hours late. Find his usual time (in hours) to reach the destination?
(a) 5.5 hours
(b) 2.5 hours
(c) 4.5 hours
(d) 6 hours

**Q13.** If tan A + sec A = p then, find sin(A)

(a) $\frac{p^2-1}{2p}$

(b) $\frac{1-p^2}{2p}$

(c) $\frac{p^2+1}{2p}$

(d) $\frac{p^2-1}{p^2+1}$

Q14. The speed of the boat in the still water is 60km/hr. and the speed of the current is 20km/hr. If the distance from A to B is 480km. Find the total time taken by the boat from going A to B and coming back from B to A.

(a) 10 hours

(b) 18 hours

(c) 20 hours

(d) 15 hours

**Q15.** Study the following graph carefully to answer the question that follow
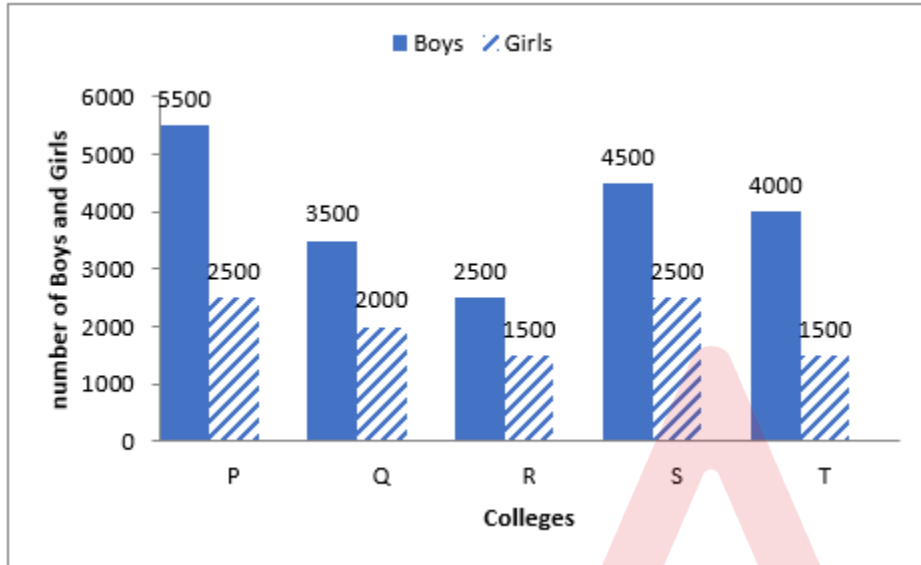
Which two colleges has the highest strength of boys and girls?

(a) Q and R

(b) R and S

(c) P and S

(d) T and S

Q16. In covering a distance of 30 km Aman takes 2 hours more than Sohan, If Aman doubles his speed, he would take 1 hour less than Sohan. Aman's speed is:

(a) 6.25 km/hr.

(b) 6 km/hr.

(c) 7.5 km/hr.

(d) 5 km/hr.

Q17. Find the value of x in the given figure.
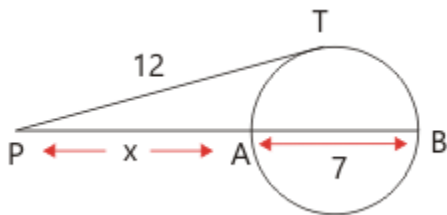
(a) 14

(b) 7

(c) 16

(d) 9

Q18.
If $\cot \dfrac{(\pi - \theta)}{2} = \sqrt{3}$, then the value of $\sin \theta - \cos \theta = ?$
(a) $\dfrac{1}{2}$
(b) $\dfrac{\sqrt{3}}{2}$
(c) $\dfrac{\sqrt{3}+1}{2}$
(d) $\dfrac{\sqrt{3}-1}{2}$

Q19. The ratio of quantity of water in fresh fruits to that of dry fruits is 7 : 2. If 400 kg of dry fruits contain 50 kg of water then find the weight of the water in same fruits when they were fresh (in kg)?
(a) 125
(b) 175
(c) 150
(d) 100

Q20. In a ΔABC, a circle is inscribed. It touches the sides AB, BC, and AC at the points P, Q and R respectively. If AP = 2cm, BQ = 5cm and CR = 7cm. Find the area of triangle
(a) $12\sqrt{3}$ cm^2
(b) $14\sqrt{5}$ cm^2
(c) 13 cm^2
(d) $16\sqrt{7}$ cm^2

Q21. Which fraction will replace the question mark (?) in the following series?
$\dfrac{1}{5}, \dfrac{1}{4}, \dfrac{3}{10}, \dfrac{7}{20}, \dfrac{2}{5}, \dfrac{9}{20}, ?$
(a) 3/11
(b) 1/2
(c) 7/11
(d) 3/20

Q22. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.
PINUOWN : QFORLXO :: PICKEL : QFDLBM :: OREGION : ?
(a)PFSBFOL
(b) LSFBFOL
(c) PSFFBLO
(d) LSBHFLO

Q23. In a certain code language, 'PRANE' is written as '13151112' and 'BELOPR' is written as '252941315'. How will 'TAKING' be written in that language?
(a) 20181347
(b) 17318144
(c) 17183114
(d)14113817

Q24. Select the correct combination of mathematical signs to sequentially replace the * signs and to balance the given equation.
20*2*40*5*95
(a) –, ×, = , +
(b) +, ×, =, –
(c) +, ×, –, =
(d) –, ×, +, =

Q25. In each of the following questions, find the odd numbers/ letters/ number pair from the given alternatives.
(a) 11 – 26
(b) 12 – 35
(c) 15 – 32
(d) 18 – 50

Q26. In a certain code language, 'STUDY' is written as 'BWXGH' and 'DRAFT' is written as 'GUDIW'. How will 'AISLE' be written in that language?
(a) VOVRZ
(b) RELAI
(c) ADEIZ
(d) VRVEA

Q27. Which of the following numbers will replace the question mark (?) in the given series?
79, 81, 85, 101, ?
(a) 193
(b) 300
(c) 357
(d) 205

Q28. If A + B means "A is the brother of B," A - B means "A is the sister of B," A * B means "A is the mother of B," and A / B means "B is the father of A," then what is the relationship between C and H if C * E + F - D / H?
(a) Mother-Son
(b) Mother-Daughter
(c) Father-Daughter
(d) Husband-wife

Q29. If A $ B means "B is the daughter of A," A # B means "A is the sister of B," A @ B means "A is the son of B," A % B means "A is the husband of B," and A ^ B means "A is the mother of B".
If A # B @ C % D $ E ^ F, then how is A related to F?
(a) Nephew
(b) Niece
(c) Aunt
(d) Cannot be determined

Q30. After arranging the given words according to dictionary order, which word will come at 'Fifth' position?
Arrogant
Arterial
Artifact
Artifice
Artificial
(a) Arrogant
(b) Artifice
(c) Artificial
(d) Artifact

Q31. Three of the following four letter-clusters are alike in a certain way and one is different. Pick the odd one out.
(a) HMS
(b) RWI
(c) UZF
(d) LPO

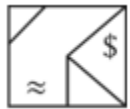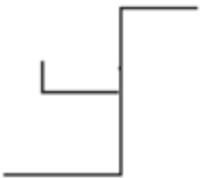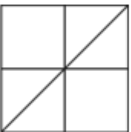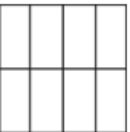**Q32.** Select the correct mirror image of given. Figure

(a)

(b)

(c)

(d)

Q33. Select the option in which the given figure is embedded?

(a)

(b)

(c)

(d)

Q34. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:
All watches are belt.
Some belt are torch.
All torches are camera.

Conclusions:
I. Some watches are torch
II. Some watches are belt.
III. All cameras are belt.
IV. Some cameras are torch.
(a) Only conclusion IV follow
(b) Only conclusion II and IV follow
(c) Only conclusions I and III follow
(d) Only conclusion III follow

Q35. In a certain code language, CAT is coded as 27, and ANIMAL is coded as 56. How will SPARROW be coded in that language?
(a) 106
(b) 116
(c) 117
(d) 107

Q36. 0, 7, 26, ___, 124, 255, 342
(a) 79
(b) 63
(c) 215
(d) 299

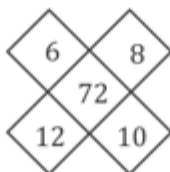**Q37.** Find the missing term of the following series.
AY, BX, CW, ___, EU
(a) DX
(b) DW
(c) DV
(d) DU

Q38. Which set of letters when sequentially placed at the gaps in the given letter series shall complete it:
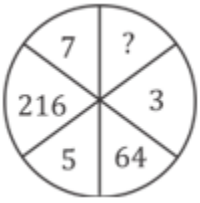z_uwx_yow_zy_wxzye_xzy_wx
(a) yzxawi
(b) zzxyiw
(c) yzxiwa
(d) wxyzie

Q39. Find out the missing numbers :

(a) 56
(b) 112
(c) 108
(d) 116

Q40. Find out the missing numbers:

(a) 164
(b) 8
(c) 216
(d) 512

Q41. Among five friends, X, Y, Z, W and V, V is heavier than only Z. X is lighter than W but heavier than Y. Who is the second lightest?
(a) X
(b) Z
(c) V
(d) W

Q42. Maria ranks 14th from the top and 18th from the bottom in a class. How many students are there in the class?
(a) 30
(b) 31
(c) 32
(d) 33

Q43. If Abhay is to the south of Badal and Chandan is to the east of Badal, in what direction is Abhay with respect to Chandan?
(a) North-west
(b) South-west
(c) South-east
(d) North-east

Directions (44-45): In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

Q44. Assertion (A): The 'right to property' is a fundamental right in India.
Reason (R): Fundamental rights are enshrined in the Indian Constitution.
(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.

Q45. Assertion (A): Diamonds are the hardest known natural substance.
Reason (R): Diamonds have a highly stable carbon-carbon covalent bond.
(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.

Q46. The shortest distance measured from the initial to the final position of an object is known as the _____.
(a) Motion
(b) Direction
(c) Velocity
(d) Displacement

Q47. The sensation of weightlessness in a spacecraft in an orbit is due to the -
(a) Absence of gravity outside
(b) Acceleration in the orbit which is equal to the acceleration due to gravity outside
(c) Presence of gravity outside but not inside the spacecraft
(d) Spacecraft in the orbit has no energy

Q48. A 100 watt electric bulb is used for 10 hours. What will be the cost of electricity consumed, if the consumption cost is Rs. 5 per unit?
(a) Rs. 5
(b) Rs. 10
(c) Rs. 25
(d) Rs. 50

Q49. Which of the following factors affects the amount of work done?
(a) Force applied
(b) Distance travelled
(c) Angle between force and displacement
(d) All of the above

Q50. Which part of the human ear amplifies sound vibrations?
(a) Cochlea
(b) Eardrum
(c) Ear canal
(d) Ossicles

Q51. A ray of light that strikes a mirror at an angle of 30 degrees to the normal will reflect at an angle of:
(a) 30 degrees
(b) 60 degrees
(c) 90 degrees
(d) 120 degrees

Q52. What is the process of conversion of solid state directly to gaseous state called?
(a) Evaporation
(b) Condensation
(c) Sublimation
(d) Distillation

Q53. A 100-kg object is moving at a speed of 20 m/s. If the object's speed is increased to 30 m/s, what is the change in kinetic energy?
(a) 100 J
(b) 200 J
(c) 300 J
(d) 400 J

Q54. What is the unit of the coefficient of self-induction?
(a) Henry
(b) Weber
(c) Tesla
(d) Faraday

Q55. Which gas is usually released when an acid reacts with a metal carbonate?
(a) Oxygen (O_2)
(b) Hydrogen (H_2)
(c) Carbon dioxide (CO_2)
(d) Nitrogen (N_2)

Q56. Which of the following is the strongest reducing agent?
(a) Lithium
(b) Sodium
(c) Potassium
(d) Calcium

Q57. What is the significance of the atomic number in determining the position of an element in the periodic table?
(a) It determines the number of valence electrons in the element
(b) It determines the number of protons in the nucleus of the element
(c) It determines the number of neutrons in the nucleus of the element
(d) It determines the number of electrons in the outermost shell of the element

Q58. Which period includes most of the man-made radioactive elements?
(a) Second period
(b) Fifth period
(c) Sixth period
(d) Seventh period

Q59. What is the Aufbau principle?
(a) Electrons fill up the orbitals of lowest energy first.
(b) Electrons fill up the orbitals of highest energy first.
(c) Electrons fill up the orbitals in a random order.
(d) Electrons fill up the orbitals in pairs, with opposite spins.

Q60. What is the term used for the self-linking ability of carbon atoms?
(a) Isomerism
(b) Catenation
(c) Valency
(d) Hybridization

Q61. Which part of the blood is primarily responsible for carrying waste products?
(a) Platelets
(b) White blood cells
(c) Red blood cells
(d) Plasma

Q62. Which of the following animals belong to the phylum Chordata?
(a) Jellyfish
(b) Snails
(c) Sharks
(d) Spiders

Q63. Which of the following lichen is called the "reindeer moss"?
(a) Cetraria islandica
(b) Cladonia rengiferina
(c) Peltigera canina
(d) Evernia

Q64. Which country was recently certified as a malaria-free country by the World Health Organization (WHO)?
(a) Cabo Verde
(b) Sri Lanka
(c) Ghana
(d) Ecuador

Q65. Who won the Women's Singles Title at the India Open Badminton 2024?
(a) P.V. Sindhu
(b) Tai Tzu Ying
(c) Carolina Marin
(d) Nozomi Okuhara

Q66. The Indo-Kyrgyzstan joint Special Forces exercise 'Khanjar' commenced in which Indian state?
(a) Uttarakhand
(b) Himachal Pradesh
(c) Jammu and Kashmir
(d) Arunachal Pradesh

Q67. Who authored the book 'Breaking the Mould: Reimagining India's Economic Future'?
(a) Narendra Modi
(b) Raghuram Rajan
(c) Rohit Lamba
(d) Arvind Subramanian

Q68. What initiative has Uttar Pradesh Chief Minister Yogi Adityanath directed officials to implement?
(a) Clean Air Policy
(b) Solar Energy Policy
(c) Green Hydrogen Policy-2023
(d) Climate Resilience Program

Q69. Tamil writer Perumal Murugan has won the JCB Prize for Literature for which novel?
(a) Inglorious Empire
(b) The Paradoxical Prime Minister
(c) An Era of Darkness
(d) Fire Bird

Q70. Which of the following is the largest satellite of the Solar System?
(a) Titan
(b) Miranda
(c) Moon
(d) Ganymede

Q71. Which are the two major rivers that emerge from the Amarkantak Plateau, but they flow in different directions?
(a) Chambal and Betwa
(b) Chambal and Sone
(c) Narmada and Sone
(d) Narmada and Betwa

Q72. What was the committee appointed by Lord Curzon to reform the police department?
(a) Fraizer Committee
(b) Raleigh Committee
(c) Hunter Commission
(d) Thomas Committee

Q73. Which one of the following pairs is not correctly matched?
(a) Partition of Bengal —— 1905
(b) Foundation of Muslim League —— 1906
(c) Surat Split —— 1907
(d) Transfer of India's Capital from Calcutta to Delhi —— 1909

Q74. In order to be appointed as the Governor of a state, one must have attained the age of
(a) 30 years
(b) 50 years
(c) 45 years
(d) 35 years

Q75. Exercise Samudra Shakti is a bilateral naval exercise between the _____.
(a) India, and Thailand
(b) India and Malaysia
(c) Indonesia and Singapore
(d) India and Indonesia

Solutions

S1. Ans.(c)
Sol.
$F_2 : F_1$
$450 : 250$
$\frac{450}{250} \times 100 = 180\%$

S2. Ans.(b)
Sol.
sin 15° sin 45° sin 75° sin 30°
at θ = 15°, sin θ sin(60 - θ) sin(60 + θ) = $\frac{1}{4}$ sin 3θ
$\Rightarrow \frac{1}{4}$ sin (3 × 15°) × sin 30°
$\Rightarrow \frac{1}{4}$ sin 45° × sin 30°
= $\frac{1}{8\sqrt{2}}$

S3. Ans.(b)
Sol.
A.T.Q

7	110	5
6	15	3
3	2	2
	0	

So, the Number is 110.

S4. Ans.(d)
Sol.
Let the ratio be 4x, 9x and 7x
A.T.Q
4x + 9x + 7x → 20x
2(a + b + c) = 20x
a + b + c = 10x
c = 6x
b = 3x
a = x

Also,

3(x) + 4(3x) + 7(6x) = 399

3x + 12x + 42x = 399

57x → 399

x → 7

c = 6x = 42

S5. Ans.(d)
Sol.

$ax - 5y = -9$

$\Rightarrow 5y = ax + 9$

$\Rightarrow y = \frac{a}{5}x + \frac{9}{5}$

Equation, $y = mx + c$

$\therefore$ slope $= \frac{a}{5} = \frac{-7}{5}$

$\therefore a = -7$

S6. Ans.(c)
Sol.

$p = 120 + 80\%$ of 120

$p = 120 + \frac{80}{100} \times 120 = 120 + 96 = 216$

$k = 216 - 40\%$ of 216

$= 60\%$ of $216 = \frac{60}{100} \times 216$

$= 129.6$

S7. Ans.(b)
Sol.

Fourth proportion of 3, 6, 12 $= \frac{6 \times 12}{3} = 24$

Fourth proportion of 7, 6, 14 $= \frac{14 \times 6}{7} = 12$

Ratio of 24: 12 = 2: 1

S8. Ans.(d)
Sol.

Ist investment $= 4x$

IInd Investment $= 5x$

Total investment $= 4x + 5x = 9x$

Total earnings on investment $= 115\%$ of $4x + 90\%$ of $5x$

$= \frac{115 \times 4x + 90 \times 5x}{100}$

$= \frac{460x + 450x}{100}$

$= \frac{910x}{100} = 9.10x$

Profit $\% = \frac{0.10}{9} \times 100$

$= \frac{100}{90} = \frac{10}{9} = 1\frac{1}{9}\%$

S9. Ans.(c)
Sol.

Diameter = 16.8 cm

radius = 8.4 cm

Volume $= \frac{2}{3} \times \frac{22}{7} \times 8.4 \times 8.4 \times 8.4$

$= 1241.856$ cm³

S10. Ans.(c)
Sol.

Height $= \frac{\sqrt{3}}{2} \times side$

$15\sqrt{3} = \frac{\sqrt{3}}{2} \times side$

Side = 30cm

Area $= \frac{\sqrt{3}}{4} (side)^2$

$= \frac{\sqrt{3}}{4} \times 900$

$= \sqrt{3} \times 225$

$= 225\sqrt{3} \; cm^2$

S11. Ans.(a)
Sol.

Banana Juice: Water

     1   :   3

   10L   : 30L + 20L (added more) = 50L

Now, Banana Juice = 10L

Total Mixture = 60L

% of banana Juice $= \frac{10}{60} \times 100 \approx 16.66\%$

S12. Ans.(c)
Sol.

       Actual: after

Speed 4 : 3

Time :-   3 : 4

         1 ⟶ 1.5 hours

Initial time = 3 × 1.5 = 4.5 hours

S13. Ans.(d)
Sol.

tan A + sec A = P

$\dfrac{\sec A - \tan A = \frac{1}{P}}{2\sec A = P + \frac{1}{P}}$

$\sec A = \frac{P^2 + 1}{2P}$

So, H = P^2 + 1, B = 2P

$\implies$ P = P^2 - 1

$\sin A = \frac{P^2 - 1}{P^2 + 1}$

S14. Ans.(b)
Sol.

Speed of upstream = (60 - 20) = 40 km/hr.

speed of downstream = (60 + 20) = 80 km/hr.

∵ Total Time $= \frac{480}{40} + \frac{480}{80} = 12 + 6 = 18$ hours

S15. Ans.(c)
Sol. P = 8000, S = 7000

S16. Ans.(d)
Sol.
Let Aman's speed = x km/hr and Sohan's speed = y km/hr.

$$\frac{30}{x} - \frac{30}{y} = 2 \text{ ... (i)} \quad \& \quad \frac{30}{y} - \frac{30}{2x} = 1 \text{ (ii)}$$

$\frac{30}{x} - 2 - \frac{30}{2x} = 1$ (Put the value in eq. ii)

$30\left(\frac{1}{2x}\right) = 3, x = 5 \text{ km/h}$

Hence, Aman's speed = 5 km/hr.

S17. Ans.(d)
Sol.
Since, PT is a tangent and PAB is a secant to the circle.
∴ PT² = PA × PB
144 = x (x+7)
⇒ x² + 7x – 144 = 0
⇒ (x + 16) (x – 9) = 0
⇒ x= 9 (x = –16 is not possible.)

S18. Ans.(c)
Sol.

$\cot\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \sqrt{3}$

$\cot\left(\frac{\pi}{2} - \frac{\theta}{2}\right) = \cot 30°$

$90° - \frac{\theta}{2} = 30°$

$\frac{\theta}{2} = 60°$

θ = 120°

Now, sinθ – cosθ = sin120° – cos120°
= sin (90° + 30°) – cos (90°+30°)
= cos 30° + sin 30°

$= \frac{\sqrt{3}}{2} + \frac{1}{2}$

$= \frac{\sqrt{3}+1}{2}$

S19. Ans.(b)
Sol. The weight of water in 400 kg of dry fruits is 50 kg.
So, the weight of fruits alone = (400 – 50) kg = 350 Kg
Here, Ratio of water in fresh fruits to the dry fruit = 7 : 2
⇒ 2 = 50 Kg
∴ 1 = 25 kg
So, the water in fresh fruits = 7 × 25 = 175 kg

Alternative method:
Quantity is same = 400 kg
Water in dry fruits = 50 kg
Fresh fruits: Dry fruits
7: 2
2 units = 50 kg, 1 unit = 25 kg
In Fresh fruits = 7 units = 7 × 25 = 175 kg

S20. Ans.(b)
Sol.

As we know,
AP = AR
BP = BQ
CQ = CR
AB = 7 cm BC = 12 cm AC = 9 cm
semi-perimeter, s = $\frac{Perimeter\ of\ triangle}{2}$ = $\frac{28}{2}$ = 14cm
Area of Δ = $\sqrt{s\ (s - AB)\ (s - BC)\ (s - AC)}$
Area of Δ = $\sqrt{14\ (7)\ (2)\ (5)}$ = $14\sqrt{5}$ cm²

S21. Ans.(b)
Sol.
The pattern is
0.20 , 0.25, 0.30, 0.35, 0.40, 0.45, 0.50
$\frac{1}{5}$, $\frac{1}{4}$, $\frac{3}{10}$, $\frac{7}{20}$, $\frac{2}{5}$, $\frac{9}{20}$, $\frac{1}{2}$

S22. Ans.(d)
Sol.

P	I	N	U	O	W	N		P	I	C	K	E	L		O	R	E	G	I	O	N
↓	↓	↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓	↓
Q	F	O	R	L	X	O		Q	F	D	L	B	M		L	S	B	H	F	L	O
+1	−3	+1	−3	−3	+1	+1		+1	−3	+1	+1	−3	+1		−3	+1	−3	+1	−3	−3	+1

Pattern ⇒ Consonant → + 1
　　　Vowel → −3

S23. Ans.(c)
Sol.

P	R	A	N	E		B	E	L	O	P	R		T	A	K	I	N	G
↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓		↓	↓	↓	↓	↓	↓
13	15	1	11	2		25	2	9	4	13	15		17	1	8	3	11	4

Pattern → constant → -3
　　　　　　　A E I O U
Vowel → ↓ ↓ ↓ ↓ ↓
　　　　　1 2 3 4 5

S24. Ans.(c)
Sol.
$20 + 2 \times 40 - 5 = 95$
$\Rightarrow 20 + 80 - 5 = 95$
$\Rightarrow 95 = 95 \rightarrow$ correct

S25. Ans.(d)
Sol.
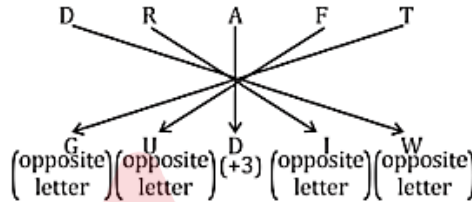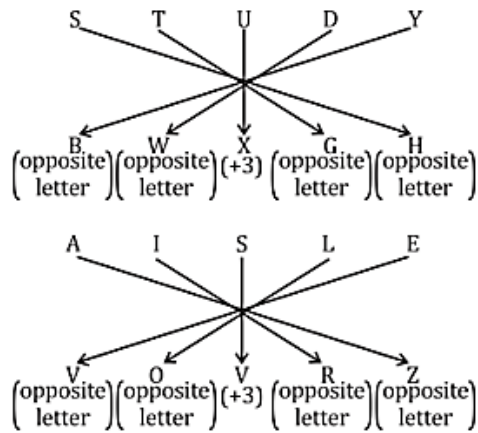Sum of all is prime number except (d)
11+26=37, It is a Prime Number.
12+35=47, (")
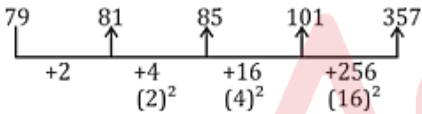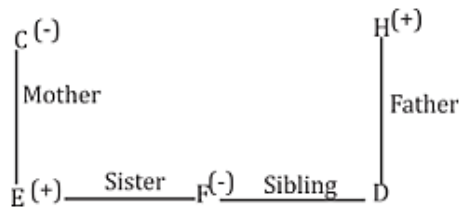15+32=47, (")
18 + 50 = 68 (Not a prime number)

S26. Ans.(a)
Sol.

S27. Ans.(c)
Sol.

S28. Ans.(d)
Sol.

S29. Ans.(c)
Sol.
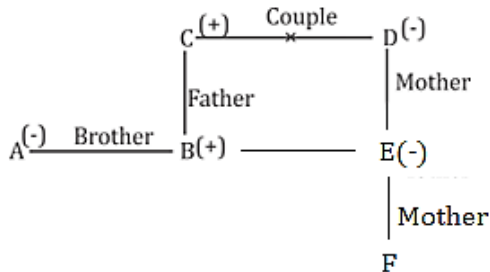
S30. Ans.(c)
Sol. After arranging the words in dictionary order : -
Arrogant → Arterial → Artifact → Artifice → Artificial

S31. Ans.(d)
Sol.
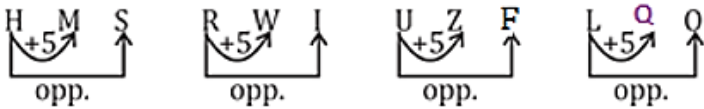
(d) is the odd – one out.

S32. Ans.(b)
Sol. Option b is correct.

S33. Ans.(b)
Sol. Option b is correct.

S34. Ans.(b)
Sol.
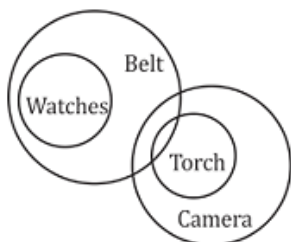
Form the Venn diagram
Conclusion 1st and 3rd don't follow
Conclusion 2nd and 4th follows.

S35. Ans.(c)
Sol. Logic: Place Value of Alphabets + No. of letters in given words
CAT $\Rightarrow$ 3 + 1 + 20 = 24 → 24 + 3 = 27
ANIMAL $\Rightarrow$ 1 + 14 + 9 + 13 + 1 + 12 = 50 → 50 + 6 = 56
SPARROW $\Rightarrow$ 19 + 16 + 1 + 18 + 18 + 15 + 23 = 110 → 110 + 7 = 117

S36. Ans.(b)
Sol.

$(1)^3 - 1 = 0$
$(2)^3 - 1 = 7$
$(3)^3 - 1 = 26$
$(4)^3 - 1 = \boxed{63}$
$(5)^3 - 1 = 124$
$(6)^3 - 1 = 215$
$(7)^3 - 1 = 342$

S37. Ans.(c)
Sol.
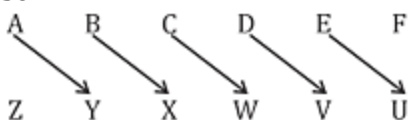
Starting with A, every alphabet is paired with the alphabet one position before the opposite alphabet.

Alternative method:

A+1 → B's opposite word → Y

B+1 → C's opposite word → X

C+1 → D's opposite word → W

D+1 → E's opposite word → V

E+1 → F's opposite word → U

S38. Ans.(c)

Sol.
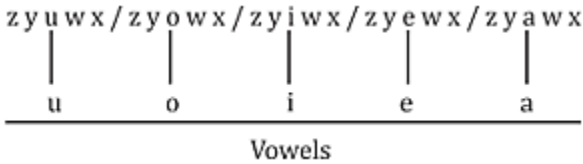
S39. Ans.(b)

Sol.

$3 + 5 + 7 + 9 = 24 \times 2 = 48$

$6 + 8 + 10 + 12 = 36 \times 2 = 72$

$11 + 13 + 15 + 17 = 56 \times 2 = \boxed{112}$

S40. Ans.(d)

Sol.

$(8)^3 = \boxed{512}$

$3 + 1 = 4$

$(4)^3 = 64$

$5 + 1 = 6$

$(6)^3 = 216$

$7 + 1 = 8$

$(8)^3 = 512$

S41. Ans.(c)

Sol.

The sequence in descending weight is:

$W > X > Y > V > Z$

S42. Ans.(b)

Sol. Total = 14 + 18 - 1 = 31 (subtracting 1 as Maria is counted twice)

S43. Ans.(b)

Sol.
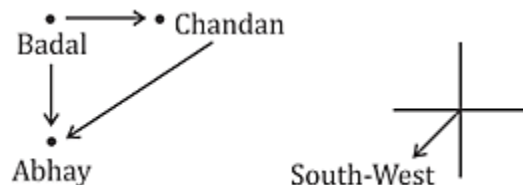
S44. Ans.(d).

Sol. A is false but R is true. The 'right to property' is not a fundamental right in India; it was removed from the list of Fundamental Rights by the 44th amendment in 1978. However, fundamental rights are indeed enshrined in the Indian Constitution.

S45. Ans.(a)
Sol. Both A and R are true and R is the correct explanation of A. The hardness of a diamond is due to its strong carbon-carbon covalent bond and the compact crystal lattice structure that these bonds form

S46. Ans.(d)
Sol. The shortest distance measured from the initial to the final position of an object is known as the displacement.
- **Direction -** Distance refers to the total path travelled by an object in motion. It is a scalar quantity, which means it has only magnitude (size) and no direction.
- **Velocity -** Velocity is a physical quantity that describes the rate of change of an object's position with respect to time. It is a vector quantity, which means it has both magnitude (speed) and direction.

S47. Ans.(b)
Sol. The sensation of weightlessness in a spacecraft in an orbit is due to the acceleration in the orbit which is equal to the acceleration due to gravity outside.
When a spacecraft is in orbit around the Earth, it is in freefall, meaning it is constantly falling towards the Earth but also moving forward at a high enough speed to maintain its altitude and never actually hits the Earth. The acceleration due to gravity and the acceleration of the spacecraft are perfectly balanced, resulting in the sensation of weightlessness for the astronauts inside the spacecraft. Therefore, it is not the absence of gravity, presence of gravity outside but not inside the spacecraft, or lack of energy that causes weightlessness in space.

S48. Ans.(a)
Sol. Energy Consumption of 100 watt electric bulb which is used for 10 hours = 100 × 10
= 1000 watt hour
= 1 kilo watt hour
= 1 unit
So, total cost is 1 x 5 = Rs.5

S49. Ans.(d)
Sol. The correct answer is (d) All of the above.
- The amount of work done on an object is defined as the product of the force applied to the object and the distance over which the force is applied. Therefore, both the force applied and the distance traveled affect the amount of work done.
- Moreover, the angle between the force and the displacement also affects the amount of work done. When the force is applied in the same direction as the displacement, the work done is maximum. However, when the force is applied perpendicular to the displacement, the work done is zero.
- Therefore, all the factors - force applied, distance travelled, and angle between force and displacement - affect the amount of work done.

S50. Ans.(d)
Sol. The answer is (d). The ossicles are the three tiny bones in the middle ear that amplify sound vibrations. The eardrum vibrates when sound waves hit it, and the ossicles amplify these vibrations before they are sent to the cochlea.
- The cochlea is the hearing organ in the inner ear, but it does not amplify sound vibrations. The cochlea converts sound vibrations into electrical signals that are sent to the brain.
- The ear canal and the eardrum do not amplify sound vibrations. The ear canal simply directs sound waves to the eardrum, and the eardrum vibrates in response to the sound waves.
- So, the answer to the question is (d). The ossicles are the parts of the human ear that amplify sound vibrations.

S51. Ans.(a)
Sol.
- The angle of reflection is equal to the angle of incidence. So, if a ray of light strikes a mirror at an angle of 30 degrees to the normal, it will reflect at an angle of 30 degrees to the normal.
- The law of reflection states that the angle of reflection is equal to the angle of incidence. The angle of incidence is the angle between the incident ray and the normal. The normal is a line perpendicular to the reflecting surface. The angle of reflection is the angle between the reflected ray and the normal.
- In this case, the incident ray is at an angle of 30 degrees to the normal. So, the reflected ray will also be at an angle of 30 degrees to the normal. This means that the reflected ray will be reflected back in the same direction as the incident ray, but on the opposite side of the normal.

S52. Ans.(c)
Sol. The answer is **(c)**, Sublimation.
Sublimation is the process of conversion of solid state directly to gaseous state without passing through the liquid state. This process occurs when the molecules of a solid have enough energy to break away from the solid lattice and enter the gas phase.
Here are some examples of substances that sublime:
- **Camphor:** Camphor is a white, crystalline solid that sublimes at room temperature.
- **Iodine:** Iodine is a black, solid that sublimes at a temperature of about 114 degrees Fahrenheit.
- **Nitrogen dioxide:** Nitrogen dioxide is a reddish-brown gas that sublimes at a temperature of about -121 degrees Fahrenheit.
Here are the explanations for all other options:
- **Evaporation:** Evaporation is the process of conversion of liquid state to gaseous state. This process occurs when the molecules of a liquid have enough energy to break away from the liquid surface and enter the gas phase. Evaporation is a surface phenomenon, meaning that it only occurs at the surface of the liquid.
- **Condensation:** Condensation is the process of conversion of gaseous state to liquid state. This process occurs when the molecules of a gas lose energy and come together to form a liquid. Condensation is the opposite of evaporation.
- **Distillation:** Distillation is a process of separating two or more miscible liquids by heating them and condensing the vapors. The vapors are then condensed back into liquids, and the liquids are separated. Distillation is a common method for purifying liquids.

S53. Ans.(c)
Sol. The answer is c) 300 J.
The formula for kinetic energy is KE = 1/2 mv^2.
In this case, we have:
- m = 100 kg
- v$_1$ = 20 m/s
- v$_2$ = 30 m/s
Plugging these values into the formula, we get:
KE = 1/2 * 100 kg * (30 m/s)^2 = 300 J
Therefore, the change in kinetic energy is 300 J.

S54. Ans.(a)
Sol. The unit of the coefficient of self-induction is (a) Henry.
- This is the unit of inductance in the International System of Units (SI). Named after Joseph Henry, an American scientist who also discovered electromagnetic induction independently, it measures the amount of resistance to the change of electric current in a conductor. In other words, one henry is the amount of inductance necessary to generate one volt of induced voltage when the current is changing at the rate of one ampere per second.
- Weber (Wb) - The unit of magnetic flux, indicating the total magnetism of an object.
- Tesla (T) - The unit of magnetic field strength, defining the force exerted on moving charges by magnetic fields.

S55. Ans.(c)
Sol.
The Correct answer is (c).
When an acid reacts with a metal carbonate, the gas that is usually released is carbon dioxide (CO_2).
The general chemical reaction between an acid (H+) and a metal carbonate (MCO_3) can be represented as follows:
2 H+ (acid) + MCO_3 (metal carbonate) → M2+ (metal ion) + CO_2 (carbon dioxide) + H_2O (water)
Here's a detailed explanation of the reaction:
1. The acid (H+) donates hydrogen ions to the metal carbonate (MCO_3). In this case, we'll consider a generic metal represented by "M."
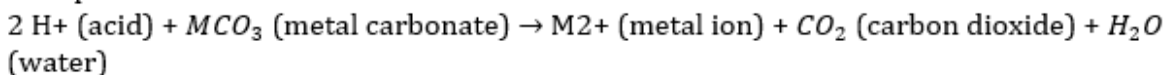
2. The metal carbonate (MCO3) dissociates into metal ions (M^{2+}) and carbonate ions (CO_3^{2-}). The hydrogen ions from the acid replace the metal ions in the carbonate.
3. The carbonate ions (CO_3^{2-}) break down further into carbon dioxide (CO_2) and oxygen ions (O^{2-}).
4. The carbon dioxide (CO_2) gas is released as a product, and the oxygen ions (O^{2-}) combine with the hydrogen ions from the acid to form water (H_2O).

The balanced equation for the reaction, using a generic metal represented by "M," would be:

$2 H+ + MCO_3 \rightarrow M^{2+} + CO_2 + H_2O$

Thus, the correct gas released during this reaction is carbon dioxide (CO_2), making option (c) the correct answer.
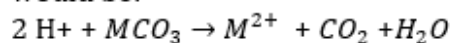
S56. Ans.(a)
Sol. Lithium is the strongest reducing agent because it has the lowest standard reduction potential. The standard reduction potential is a measure of how easily an element can lose electrons. The lower the standard reduction potential, the easier it is for the element to lose electrons and the stronger the reducing agent.

Sodium has a higher standard reduction potential than lithium, so it is not as strong of a reducing agent. Potassium has a higher standard reduction potential than sodium, so it is even less of a strong reducing agent. Calcium has the highest standard reduction potential of the four elements, so it is the weakest reducing agent.

S57. Ans.(b)
Sol. The atomic number of an element is equal to the number of protons in the nucleus of the atom, which is the basis for the organization of elements in the periodic table.
• The atomic number of an element represents the number of protons present in its nucleus, which also determines the number of electrons in a neutral atom. The position of an element in the periodic table is based on its atomic number.

S58. Ans.(d)
Sol. The seventh period of the periodic table includes most of the man-made radioactive elements. This period is also the longest period with 32 elements, starting with Francium (Fr) and ending with Oganesson (Og), which has the highest atomic number of any known element.
• The radioactive elements in this period are mainly produced through nuclear reactions in laboratories and have very short half-lives.
• Some of the most well-known man-made radioactive elements in this period include americium, berkelium, californium, einsteinium, fermium, mendelevium, nobelium, and lawrencium.

S59. Ans.(a)
Sol. The Aufbau principle states that electrons fill up the orbitals of lowest energy first. So the answer is (a).
• The Aufbau principle is based on the principle of minimum energy, which states that atoms will tend to have the lowest possible energy state. By filling up the orbitals of lowest energy first, atoms can achieve a lower energy state.
• The Aufbau principle is a very important principle in chemistry, as it allows us to predict the electron configurations of atoms. The electron configuration of an atom is a representation of how the electrons are arranged in the atom's orbitals. Knowing the electron configuration of an atom can help us to understand the chemical properties of the atom.

S60. Ans.(b)
Sol. The term for the self-linking ability of carbon atoms is catenation. So the answer is (b).
Catenation is a unique property of carbon, where carbon atoms can form strong covalent bonds with other carbon atoms, leading to the formation of long chains, branched structures, and rings. This ability to form extensive chains of carbon atoms is the basis for the vast diversity of organic compounds found in nature and the complexity of organic chemistry.
The carbon-carbon bonds can be single, double, or triple bonds, allowing for a wide variety of organic molecules with different properties and functions. These carbon chains can incorporate other elements such as hydrogen, oxygen, nitrogen, and many others, further increasing the potential for diverse compounds.

S61. Ans.(d)

Sol. The answer is (d). Plasma

Plasma is the liquid part of blood and it carries waste products, such as urea, creatinine, and ammonia. Platelets are responsible for blood clotting, white blood cells are responsible for fighting infection, and red blood cells carry oxygen. So the answer is (d).

Here are some additional details about the role of plasma in carrying waste products:

- Plasma is the liquid part of blood that makes up about 55% of the total volume of blood.
- Plasma contains dissolved proteins, nutrients, hormones, and waste products.
- Waste products are produced by the cells of the body and are carried by the blood to the kidneys, where they are filtered out and excreted in the urine.
- Plasma also helps to transport oxygen and carbon dioxide around the body.

S62. Ans.(c)

Sol. The answer is (c). Sharks belong to the phylum Chordata. Jellyfish, snails, and spiders do not belong to the phylum Chordata.

- **Chordates** are animals that have a notochord, a dorsal nerve cord, pharyngeal slits, and a post-anal tail at some point in their life cycle. The notochord is a rod-like structure that provides support for the body. The dorsal nerve cord is a bundle of nerves that runs along the back of the animal. Pharyngeal slits are openings in the pharynx that allow water to pass through the body. The post-anal tail is a tail that extends beyond the anus.
- **Jellyfish** are invertebrates that do not have a notochord, a dorsal nerve cord, or pharyngeal slits. They do have a primitive nervous system, but it is not organized into a dorsal nerve cord.
- **Snails** are also invertebrates that do not have a notochord, a dorsal nerve cord, or pharyngeal slits. They have a simple nervous system, but it is not organized into a dorsal nerve cord.
- **Spiders** are arachnids that do not have a notochord, a dorsal nerve cord, or pharyngeal slits. They have a simple nervous system, but it is not organized into a dorsal nerve cord.
- Therefore, the only animal that belongs to the phylum Chordata is sharks. So the answer is (c).

S63. Ans.(b)

Sol. The answer is (b), Cladonia rangiferina.

Here is the solution in detail:

- **Cetraria islandica** is called Iceland moss. It is a fruticose lichen that is found in cold, northern regions. It is not called reindeer moss.
- **Peltigera canina** is called dog lichen. It is a foliose lichen that is found in a variety of habitats, including forests, meadows, and even urban areas. It is not called reindeer moss.
- **Evernia** is a genus of lichens that includes Evernia prunastri, which is called oakmoss. It is not called reindeer moss.

Cladonia rangiferina is a fruticose lichen that is commonly called reindeer moss. It is found in cold, northern regions and is a food source for reindeer, caribou, and other animals. Cladonia rangiferina is also used in traditional medicine.

The name "reindeer moss" is a misnomer, as reindeer moss is not actually a moss. It is a lichen, which is a symbiotic relationship between a fungus and an alga.

S64. Ans.(a)

Sol. The Correct answer is (a) Cabo Verde

The World Health Organization (WHO) recently certified Cabo Verde, also known as Cape Verde, as a malaria-free country. This certification marks a significant achievement in the global fight against malaria and represents a major milestone for Cabo Verde, an archipelago of 10 islands in the Central Atlantic Ocean.

Cabo Verde's certification as malaria-free is particularly notable given the country's previous struggles with the disease. Before the 1950s, all of its islands were affected by malaria, and the nation experienced severe epidemics, especially in its most densely populated areas. However, through targeted interventions, including the use of insecticide spraying, Cabo Verde successfully eliminated malaria twice, in 1967 and 1983. Despite a resurgence of the disease due to lapses in vector control, the nation has now been malaria-free since 2017.

S65. Ans.(b)
Sol. The Correct answer is (b) Tai Tzu Ying
- The Women's Singles Title at the India Open Badminton 2024 was won by Tai Tzu Ying from Chinese Taipei. She secured her victory by defeating Chen Yu Fei from China in the final with a score of 21-16, 21-12
- Men's Singles: In the Men's Singles category, Chinese player Shi Yuqi claimed the title. He achieved victory against Lee Cheuk Yiu from Hong Kong with scores of 23-21, 21-17
- The 2024 India Open (officially known as the Yonex Sunrise India Open 2024 for sponsorship reasons) was a badminton tournament that took place at the K. D. Jadhav Indoor Stadium, New Delhi, India, from 16 to 21 January 2024
- The 2024 India Open was the second tournament of the 2024 BWF World Tour and was part of the India Open championships, which had been held since 1973. This tournament was organized by the Badminton Association of India with sanction from the BWF.

S66. Ans.(b)
Sol. The Correct answer is (b) Himachal Pradesh
The Indo-Kyrgyzstan joint special forces exercise 'Khanjar' commenced in Himachal Pradesh, India. This exercise is an annual event conducted alternately in both India and Kyrgyzstan. The 11th edition of the exercise took place at the Special Forces Training School in Bakloh, Himachal Pradesh, and was scheduled to be conducted from 22nd January to 3rd February 2024. The exercise involves drills and simulations for counterterrorism operations in mountainous areas, aiming to enhance the cooperation and capabilities of both nations' special forces.

S67. Ans.(b)
Sol. The book "Breaking the Mould: Reimagining India's Economic Future" was co-authored by (b) Raghuram Rajan and Rohit Lamba.
Raghuram Rajan: A world-renowned Indian economist who served as the 23rd Governor of the Reserve Bank of India and the Chief Economist of the International Monetary Fund. He is currently a distinguished service professor at the University of Chicago Booth School of Business.
Rohit Lamba: A former McKinsey & Company consultant and entrepreneur who has worked extensively on issues related to Indian economic development.

S68. Ans.(c)
Sol. The answer is (c) Green Hydrogen Policy-2023.
- In December 2023, Uttar Pradesh Chief Minister Yogi Adityanath directed officials to implement the Green Hydrogen Policy-2023.
- This policy aims to encourage clean and green energy production sources in the state by promoting the use of green hydrogen.
- Green hydrogen is produced using renewable energy sources like solar and wind power, making it a clean and sustainable alternative to fossil fuels.
- The policy includes incentives for companies setting up green hydrogen production units in Uttar Pradesh, such as land availability, exemption from stamp duty and electricity duty, capital and interest subsidies, and attractive incentives.

S69. Ans.(d)
Sol. The correct answer is (d) Fire Bird.
Tamil writer Perumal Murugan won the 2023 JCB Prize for Literature for his novel "Fire Bird," which was translated into English by Janani Kannan. The award was announced in a virtual ceremony on November 18, 2023. "Fire Bird" is a tale of displacement, loss, and the search for belonging. It tells the story of a family who is forced to leave their ancestral home and relocate to a new town.
Murugan is a renowned Tamil writer who has written several novels, short stories, and essays. He is known for his honest and unflinching portrayal of human emotions and his exploration of social and political issues.

S70. Ans.(d)
Sol. Ganymede is a satellite of Jupiter and the largest satellite in our solar system. It is larger than Mercury and Pluto and three-quarters the size of Mars.

S71. Ans.(c)
Sol. Narmada and Sone are the two major rivers that emerge from the Amarkantak Plateau, but they flow in different directions.
- The Amarkantak Plateau is located in the Maikal Hills in central India and is the source of several major rivers.
- The Narmada River originates from the Amarkantak Plateau and flows westward through the states of Madhya Pradesh, Maharashtra, and Gujarat before emptying into the Arabian Sea.
- The Sone River also originates from the Amarkantak Plateau and flows eastward through the states of Madhya Pradesh, Bihar, and Jharkhand before joining the Ganga River.
- The Chambal River originates in the Mhow region near Indore in Madhya Pradesh and flows in a northeasterly direction through Madhya Pradesh, Rajasthan, and Uttar Pradesh before joining the Yamuna River in Uttar Pradesh.
- The Betwa River originates near Hoshangabad in Madhya Pradesh and flows in a northeasterly direction through Madhya Pradesh and Uttar Pradesh before joining the Yamuna River in Uttar Pradesh.

S72. Ans.(a)
Sol. In 1902-03, a Police Commission was established for the Police reforms under Sir Andrew Frazer and Lord Curzon. It recommended the appointment of Indians at officer level in the police.
It recommended a separate Training center for officers and constables.
It introduced provincial police service and also at the same time to make Indian Army modern fighting force then Commander-in-chief Lord Kitchener made reform in the Indian Military.

S73. Ans.(d)
Sol. The pair that is not correctly matched is option (d) - Transfer of India's Capital from Calcutta to Delhi in 1909. The transfer of India's capital from Calcutta (now Kolkata) to Delhi did not occur in 1909. The correct year for the transfer of India's capital from Calcutta to Delhi is 1911. In 1911, during the reign of British Viceroy Lord Hardinge, the decision was made to shift the capital of British India from Calcutta to Delhi. The foundation of New Delhi as the new capital began in 1912 and the transfer was completed by 1931.
- **Partition of Bengal in 1905:** The partition of Bengal was carried out by Lord Curzon in 1905. The province of Bengal was divided into two separate entities - Bengal Presidency and East Bengal and Assam. The partition was met with widespread opposition and protests from Indian nationalists, as it was seen as a divisive move aimed at weakening the growing nationalist movement.
- **Foundation of Muslim League in 1906:** The All India Muslim League was founded in 1906 in Dhaka, with the objective of safeguarding the political rights and interests of Muslims in India. The foundation of the Muslim League was a response to the perceived marginalization of Muslim interests within the Indian National Congress, and it played a significant role in the political landscape leading up to the eventual partition of India in 1947.
- **Surat Split in 1907:** The Surat Split refers to a significant division within the Indian National Congress that occurred during the Surat session of 1907. The split was mainly between the extremist and moderate factions within the Congress, led by leaders such as Bal Gangadhar Tilak and Gopal Krishna Gokhale, respectively. The differences in ideologies and approaches between the two factions led to a heated confrontation, resulting in the split and weakening of the Congress temporarily.

S74. Ans.(d)
Sol. The Correct answer is (d)
A governor must:
- Be a citizen of India.
- Be at least 35 years of age.
- Not be a member of either house of the parliament or the house of the state legislature.
- Not hold any office of profit.

S75. Ans.(d)
Sol. Exercise Samudra Shakti is a bilateral naval exercise between the Indian Navy and the Indonesian Navy. The exercise was first held in 2018 and is held biennially. The aim of the exercise is to enhance cooperation and interoperability between the two navies in maritime operations.
The exercise is conducted in two phases: a harbour phase and a sea phase.