RRB Group D Previous Year Paper (Held on: 17 Sept 2022 Shift 3)

RRB Group D • 2022 • 100 questions • 90 minutes • Answer key and solutions

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CBT

Q1. An electric lamp of 30 Ω resistance and a conductor of 6 Ω resistance are connected in series to a 6 V battery. The total resistance of the circuit is:

(a) 30 Ω
(b) 36 Ω
(c) 24 Ω
(d) 42 Ω

Q2. Evaluate $23^3 + (-11)^3 + (-12)^3$.

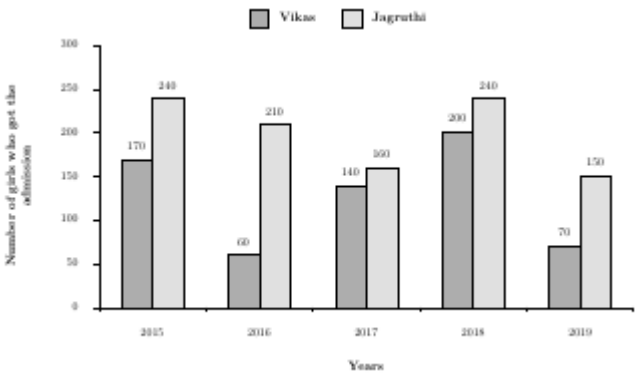
(a) 9108
(b) 8708
(c) 8908
(d) 8608

Q3. Which of the following is NOT a capital receipt?

(a) Recovery of loans
(b) Borrowings from other countries
(c) Sale of public sector undertaking
(d) Interest received on loans

Q4. Study the graph and answer the question that follows.

The following bar graph shows the total numbers of girls who got the admission in two degree colleges Vikas and Jagruthi from 2015 to 2019 are given.



What is the ratio between total girl students in 2016 to the total girl students in 2019 of both degree colleges?

(a) 27 : 22
(b) 29 : 12
(c) 25 : 21
(d) 31 : 11

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Q5. Red cabbage is a natural indicator which gives different colour when mixed with an acid or a base. Identify the change in colour when it is mixed with an alkaline solution.

(a) Reddish brown
(b) Orange
(c) Pale pink
(d) Bluish green

Q6. Which of the following states has the largest deposits of jet black granite?

(a) Madya Pradesh
(b) Karnataka
(c) Odisha
(d) Rajasthan

Q7. The President can nominate not more than _____ members from the Anglo-Indian community if he/she feels that the said community is not adequately represented in the House of the people.

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

Q8. The Village and Small-Scale Industries Committee, passed in 1955, which noted the possibility of using small-scale industries for promoting rural development, is also known as _____.

(a) The Kothari Committee
(b) The Abid Hussain Committee
(c) The Nayak Committee
(d) The Karve Committee

Q9. Which one of the following is not a part of the Local Government in India?

(a) Gram Panchayat
(b) Zila Parishad
(c) Development Authority
(d) Nagar Palika

Q10. Warts are caused by:

(a) algae
(b) fungus
(c) virus
(d) bacterium

Q11. Refer to the number and symbol series, and answer the question that follows.

(Left) 6 % 7 & 9 4 3 @ 2 8 * 3 # 9 & 2 (Right)

How many symbols are there between the third element from the right end and the fourth element from the left end of the given series?

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

Q12. _____ is a skill training program launched by Microsoft in collaboration with Ministry of Labour and Employment (MoLE) of India in September 2021.

(a) DigiUday
(b) DigiSmart
(c) DigiUtkarsh
(d) DigiSaksham

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Q13. Study the following table carefully and answer the questions based on it.

The table below shows the number of Air coolers sold on different days by five different stores in a city.

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
P	45	40	28	48	20	20	24
Q	92	90	12	27	16	26	98
R	36	80	13	30	38	47	62
S	46	60	64	12	52	76	34
T	18	48	69	58	80	15	10

What is the average of number of Air coolers sold by the store Q on Thursday, store T on Saturday and store S on Tuesday?

(a) 34
(b) 52
(c) 24
(d) 44

Q14. Five years hence the age of Ramesh will be three times the then age of his son, and 5 years ago his age was seven times the then age of his son. Ramesh's present age (in years) is:

(a) 38
(b) 40
(c) 42
(d) 44

Q15. A certain number of class XII students are standing together; each are of different weights. When their weights are compared, Adya is heavier than Dilipa, but lighter than Fiya. Charu is lighter than Esha and heavier than Bidan, who is heavier than Fiya. Only one student is heavier than Esha. Only two students are lighter than Dilipa. If no other student is part of the group, what is the total number of students in the group?

(a) Nine
(b) Seven
(c) Six
(d) Ten

Q16. Which of the following options is the closest appro×imate value which will come in place of question mark (?) in the following equation?

23.96 + 24.96 + 23.16 - 18.89 × 3.04 + 36.13 ÷ 6.1 = ?

(a) 25
(b) 27
(c) 21
(d) 23

Q17. A bus is moving at a speed of 84 km/h. If its speed is reduced by 12%, the new speed of the bus (in km/h) will be:

(a) 72.92
(b) 71.92
(c) 73.92
(d) 70.92

Q18. In which state from following, we can see the local wind 'Loo' in summer season from following?

(a) Assam
(b) Rajasthan
(c) Maharashtra
(d) Telangana

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Q19. The population of a town in 1980 was 2,25,000. If its population increased in two successive decades by 10% in each decade, the population of the town in 2000 was:

(a) 2,72,250
(b) 2,72,450
(c) 2,72,350
(d) 2,72,150

Q20. In this question, a group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/ symbol	**•**	**2**	**@**	**5**	**^**	**•**	**7**	**#**	**%**	**9**
Letter code	J	P	A	F	D	N	R	K	M	Z

Conditions:

(i) If the first element is a symbol and the last, a number, the codes for these two (the first and the last elements) are to be interchanged.

(ii) If the first element is an odd number and the last, an even number, the first and last elements are to be coded as $.

Which of the following will be the code for + 5 ^ 9 # 2 ?

(a) N D F Z K P
(b) N F D Z K P
(c) F D Z K P N
(d) P F D Z K N

Q21. Refer to the following letter series and answer the question.

(Left) Q A Y S R E Z I L X B O P A R D I H O U K (Right)

How many such consonants are there, each of which is immediately preceded by a vowel and also immediately followed by a vowel?

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

Q22. If the diameter of a sphere is 12 cm, then find the volume of the sphere. [Use π=22/7]

(a) 906 6/7 cm^3
(b) 908 2/7 cm3
(c) 907 4/7 cm3
(d) 905 1/7 cm3

Q23. A statement is followed by two conclusions. Find out which conclusion is true based on the given statement.

Statement:

$Q < A < B \leq C > D > E \geq F$

Conclusions:

I. $F < C$

II. $D < A$

(a) Only conclusion II is true
(b) Both conclusions I and II are true
(c) Only conclusion I is true
(d) Neither conclusion I nor II is true

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Q24. Each of the digits in the number 56137428 is arranged in ascending order from left to right. What will be the sum of the digits which are second from the left and second from the right in the new number thus formed?

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

Q25. The roots of the quadratic equation x+10/x=7 are:

(a) -5, 2
(b) 5, 2
(c) -2, 5
(d) 2, -5

Q26. Which of the following numbers will replace the question mark (?) in the given series?

1, 8, 7, 14, 13, 20, 19, 26, 25, ?

(a) 30
(b) 32
(c) 31
(d) 29

Q27. Using the fact that 4515 ÷ 12.9 = 350, find the value of 4.515 ÷ 12.9 ?

(a) 35
(b) 3.5
(c) 0.035
(d) 0.35

Q28. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

(NOTE: Op erations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. EXAMPLE: 13 - Operations on 13 such as adding/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

(12, 8, 90)

(8, 8, 58)

(a) (11, 7, 72)
(b) (13, 7, 85)
(c) (9, 8, 78)
(d) (5, 8, 30)

Q29. The Baisakhi festival in India marks the birth of Khalsa Panth under Guru Gobind Singh, the _____ Guru of Sikhs, in the year 1699.

(a) 9^(th)
(b) 10^(th)
(c) 8^(th)
(d) 7^(th)

Q30. What does 'Barchans' (Barkhans) refer to?

(a) Type of hut in deserts
(b) Shrub in desert
(c) Hot winds in desert
(d) Sand dune

Q31. A trader offers a discount of 10% on an article if a customer makes the payment in cash. How much percentage above the cost price should he mark the article to make a profit of 10%? [Give your answer correct to 2 decimal places.]

(a) 20.22%
(b) 15.22%

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(c) 11.22%
(d) 22.22%

Q32. Shiv started from his office and walked 15 m towards the south. He then turned right and walked 20 m. He then turned right again and walked 15 m. He then turned left and walked another 15 m to reach the place where his car is parked. How far and in which direction is the car parked from the office?

(a) 15 meters West
(b) 15 meters East
(c) 35 meters West
(d) 20 meters North

Q33. Which canal brought considerable greenery to Rajasthan?

(a) Buckingham canal
(b) Agra canal
(c) Handri-Neeva canal
(d) Indira Gandhi canal

Q34. Each vowel in the word FRANTIC is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. Which of the following letters will appear twice in the group of letters thus formed?

(a) B
(b) R
(c) J
(d) Q

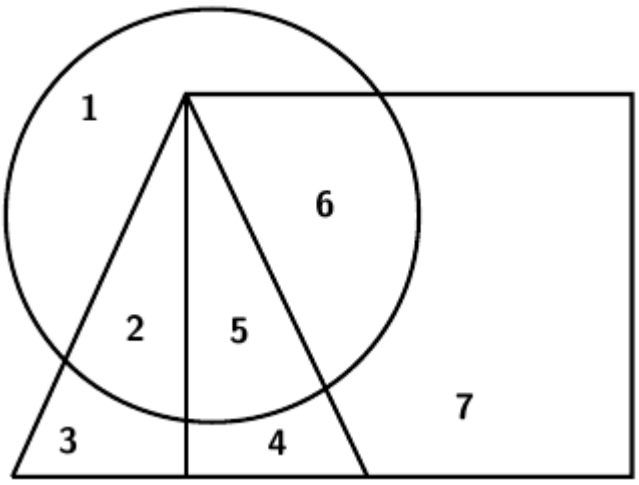
Q35. The value of [(k^a)^(b-c)× (k^b)^(c-a) × (k^c)^(a-b)] × (x^0 - 1) is

(a) 1
(b) a + b + c
(c) 0
(d) abc

Q36. The sum of the ages of William and Brijesh is 20 years. Four years ago, Brijesh's age was half of William's age then. How old (in years) is William at present?

(a) 10
(b) 12
(c) 6
(d) 8

Q37. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. The circle represents 'doctors', the square represents 'men', and the triangle represents 'philanthropists'. How many philanthropists are there who are NEITHER men NOR doctors?



(a) 4

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

Q38. Under the Scheme for Protection and Preservation of Endangered Languages of India (SPPEL), the Central Institute of Indian Languages (CIIL) works on protection, preservation and documentation of all the mother tongues/languages of India spoken by less than _____ people, which are called endangered languages

(a) 10,000
(b) 5000
(c) 20,000
(d) 15,000

Q39. In an electric circuit, where 3 lamps A, B and C of resistances 10 Ω, 20 Ω and 30 Ω, respectively, are in parallel and a battery of 60 V is applied across them, the total power dissipation in the circuit is:

(a) 620 W
(b) 560 W
(c) 700 W
(d) 660 W

Q40. Which of the following numbers will replace the question mark (?) in the given series?

3, 1, 5, -1, 7, ?

(a) 9
(b) 2
(c) -3
(d) -2

Q41. The mean marks of the following distribution is:

Marks obtained	No. of students
25	5
30	6
35	3
40	1

(a) 32
(b) 29
(c) 31
(d) 30

Q42. Six persons, Aditya, Binod, Chaya, Dilshan, Estar and Fatima, travelled in different months of the same year viz. January, March, May, July, September and November. None of them travelled after Binod, who travelled immediately after Chaya. Only three people travelled before Estar. Aditya travelled immediately after Fatima. Dilshan did not travel in the month of May.

Who among them travelled in May?

(a) Fatima
(b) Estar
(c) Aditya
(d) Chaya

Q43. Six persons, A, B, C, D, E and F, travelled in different months of the same year, viz. January, March, May, July, September and November. None of them travelled after B, and he travels just after C. Only three people travelled before E. A travelled just after F. D did not travel in the month of May. Who among the following travelled in May?

(a) F
(b) A
(c) C

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(d) E

Q44. What is the difference between the molecular masses of two successive members of the homologous series?

(a) 8 u
(b) 12 u
(c) 6 u
(d) 14 u

Q45. The site of complete digestion of carbohydrates, proteins and fat is:

(a) the stomach
(b) the small intestine
(c) the rectum
(d) the large intestine

Q46. According to Reserve Bank of India, which is a foreign Bank in India from following-

(a) YES Bank Ltd.
(b) Sonali Bank Ltd.
(c) Induslnd Bank Ltd
(d) DCB Bank Ltd.

Q47. The value of $3 + 3 \times [\{11 - 2\} \div 3] - 2 \times 3$ is:

(a) 7
(b) 6
(c) 9
(d) 8

Q48. An object is placed in front of a concave mirror of focal length 18 cm, at a distance of 12 cm. The magnification produced by the mirror is _____.

(a) -0.6
(b) +3
(c) -3
(d) +0.6

Q49. Excess demand leads to:

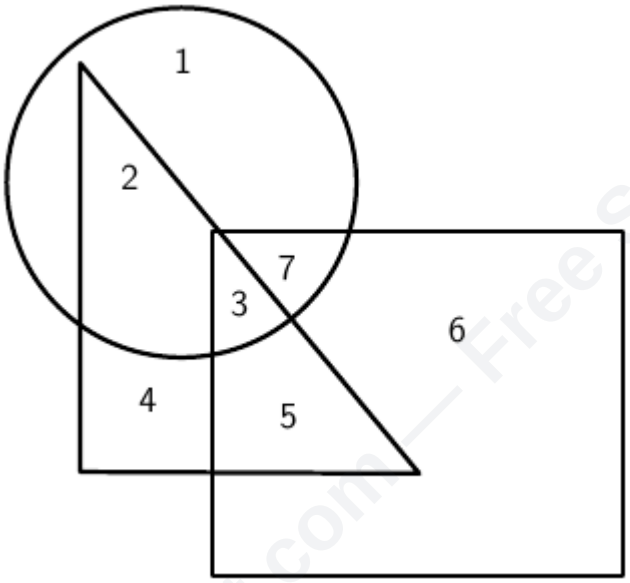
(A) inflationary gap.

(B) rise in employment level.

(a) Neither A nor B
(b) Only A
(c) Both A and B
(d) Only B

Q50. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. The circle represents 'hockey players', the square represents 'golf players', and the triangle represents 'badminton players'. How many persons are there who play both golf and hockey but NOT badminton?

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(a) 6
(b) 7
(c) 5
(d) 4

Q51. Biodegradable plastics are the new industry for export as well as marketing. Some advantages of these plastics are mentioned below. Which option is NOT an advantage?

(a) Easy to recycle
(b) Cannot be composted
(c) Less greenhouse emissions
(d) Consume less energy for manufacture

Q52. The length of a rectangular park is 22 m more than its breadth. Its area is 1400 m². Its breadth (in m) is:

(a) 35
(b) 21
(c) 28
(d) 42

Q53. Rs. 2,000 is divided among A, B and C such that half of A's part, one-third of B's part and one-fifth of C's part are equal. What is A's part (in Rs.)?

(a) 200
(b) 600
(c) 1,000
(d) 400

Q54. Which of the following substances is being oxidised in the given reaction?

$4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$

(a) Fe(s)
(b) $O_2(g)$
(c) Both Fe(s) and $Fe_2O_3(s)$
(d) $Fe_2O_3(s)$

Q55. In April 2021 the Union Education Minister launched the world's first microsensor-based explosive trace detector called 'NanoSniffer'. NanoSniffer was developed by which IIT incubated startup?

(a) IIT-Kharagpur
(b) IIT-Bombay
(c) IIT-Madras
(d) IIT-Hyderabad

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Q56. Find the value of [(12 ÷ 4) ×{12/3+5/3 ×(7-4)}]

(a) 54
(b) 45
(c) 36
(d) 27

Q57. If the digits of the number 2079816 are arranged in increasing order from left to right, what will be the middle digit?

(a) 8
(b) 6
(c) 2
(d) 7

Q58. Simplify the given expression.

(0.068 × 3.5 × 12)/(3.6 × 0.17 × 7)

(a) 4/7
(b) 3/8
(c) 2/3
(d) 1/4

Q59. Kamal is at a distance of 10 m south-west of Laxmi. If Mohit is 10 m south-east of Laxmi, then Mohit is in which direction with respect to Kamal?

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

Q60. Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

ULJ - POO - KLT

LMF - GNK - BMP

(a) PIO - KRT - FIY
(b) YVJ - UEO - QVT
(c) GTF - BGJ - GTN
(d) RGF - STK - TGP

Q61. The marked price of an article is Rs. 150. The shopkeeper offers a discount of 20% on the purchase of the article. Thereby, he makes a profit of 25%. The cost price of the article is:

(a) Rs. 96
(b) Rs. 72
(c) Rs. 120
(d) Rs. 144

Q62. When we observe the floor of a swimming pool filled with water we notice that the pool looks:

(a) less deep than it actually is
(b) More wider than it actually is
(c) less wide than it actually is
(d) deeper than it actually is

Q63. A man spends 20% of his monthly salary on the rent of his house. If every month he also spends Rs. 600 on his conveyance and Rs. 3,500 on his grocery and saves the remaining Rs. 500, his monthly salary is:

(a) Rs. 5,500
(b) Rs. 5,750
(c) Rs. 5,250
(d) Rs. 5,000

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Q64. Yajur Veda deals with _____.

(a) the Gayatri Mantra
(b) spells and charms
(c) melodies
(d) the rituals of the Yagna

Q65. The nature of the roots of the quadratic equation $(x + 12)(x + 6) = 4^2$ satisfy the following:

(a) both the roots are irrational
(b) both the roots are negative and rational
(c) one of the roots is positive and the other one is negative, and both are rational
(d) both the roots are positive and rational

Q66. Which of the following is NOT NECESSARILY true for congruent triangles?

(a) If the three sides of one triangle are equal to the corresponding three sides of another triangle, then the two triangles are congruent.
(b) If two angles and the included side of one triangle are equal to two angles and the included side of another triangle, then the two triangles are congruent.
(c) If any two sides and the angle included between the sides of one triangle are equal to the corresponding two sides and the angle included between those two sides of the second triangle, then the two triangles are congruent.
(d) If two sides and an angle of one triangle are equal to two sides and an angle of the other triangle, then the two triangles are congruent.

Q67. 1000 identical small spheres are cast from a sphere of radius 10 cm, with the total volume of the small spheres being equal to the volume of the larger sphere. The diameter (in cm) of each of the small spheres is:

(a) 0.5
(b) 3
(c) 2
(d) 1

Q68. As on August 2022, the Pradhan Mantri Shram Yogi Maandhan (PM-SYM) Yojana, is a voluntary and contributory pension scheme for providing monthly minimum assured pension of _____ after attaining the age of 60 years.

(a) Rs. 3,000
(b) Rs. 5,000
(c) Rs. 2,000
(d) Rs. 4,000

Q69. Who became U-20 World Wrestling Champion in August, 2022?

(a) Anshu Malik
(b) Mulaym Yadav
(c) Sushil Kumar
(d) Antim Panghal

Q70. Five friends, Sandya, Rinku, Prachi, Thiru and Madavi, are sitting on a bench in a playground, facing north (but not necessarily in the same order). Sandya is to the immediate left of Rinku and to the immediate right of Prachi. Madavi is somewhere to the right of Rinku. Thiru is an immediate neighbour of both Rinku and Madavi.

Who is sitting at the rightmost end?

(a) Sandya
(b) Prachi
(c) Rinku
(d) Madavi

Q71. The minimum age required to contest the election for the President of India is _____.

(a) 32 years
(b) 21 years
(c) 25 years
(d) 35 Years

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Q72. Six students P, Q, R, S, T and U are standing in a straight row such that all of them are facing towards north, but not necessarily in the same order. Q stands second from one of the ends and immediately to the right of P. Only two persons stand between P and R. R stands second to the left of the T. The number of persons standing to the left of T is the same as to the right of P. T stands at the extreme right end of the row and to the immediate right of U. Q stands third to the left of U and stands to the immediate left of S. How many persons stand between Q and U?

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

Q73. The sum of the digits of a 2-digit number is 9. The number at the tens' place is double of the number at the units' place.

The 2-digit number is:

(a) 54
(b) 45
(c) 36
(d) 63

Q74. The common domestic power supplied in India is given by which of the following?

(a) 110 V, 60 Hz
(b) 220 V, 100Hz
(c) 110 V, 50 Hz
(d) 220 V, 50 Hz

Q75. Refer to the following letter series and answer the question.

A C P D I U V K J Q E V F

How many consonants have one vowel on one side and one consonant on the other side as immediate neighbours?

(a) 7
(b) 6
(c) 4
(d) 5

Q76. The gum produced by various types of trees like Acacia trees is _____.

(a) a form of stored food
(b) an insect-repellent substance
(c) an indication of poor health/infection
(d) a waste product of these plants

Q77. A statement is given followed by two arguments I and II. Read the statement and the arguments carefully and select the appropriate answer from the given options.

Statement:

Keeping children below the age of two in day care should be avoided as it only has disadvantages.

Arguments:

I. Since some parents have full time jobs with no one to take care of their children at home, keeping children in day care can provide the children with the required care.

II. Children at day care benefit by having other children around and develop good social skills.

(a) Both I and II weaken the statement
(b) II weakens, while I strengthens the statement
(c) I weakens, while II strengthens the statement
(d) Both I and II strengthen the statement

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Q78. Which of the following chemical compounds is known as marble?

(a) Calcium carbonate
(b) Calcium oxide
(c) Calcium bicarbonate
(d) Calcium hydroxide

Q79. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13 - Operations on 13 such as adding/deleting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

(11, 202, 9)

(13, 233, 8)

(a) (17, 231, 9)
(b) (15, 255, 8)
(c) (15, 274, 7)
(d) (9, 181, 7)

Q80. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

OZF6, QWK12, STP18, UQU24, ?

(a) WNZ30
(b) WNZ32
(c) WNY 30
(d) VMZ32

Q81. The compound 'X' is produced when baking soda is heated. Recrystallization of X gives compound 'Y'. Select the compounds X and Y, respectively.

(a) Sodium carbonate and washing soda
(b) Sodium carbonate and bleaching powder
(c) Sodium bicarbonate and washing soda
(d) Sodium bicarbonate and bleaching powder

Q82. Where can we find spores in a fern plant?

(a) On special branches called sporangia
(b) In the central chamber of flowers
(c) At the underside of leaves
(d) At the tips of older leaves

Q83. Magnetic field lines never cross each other. This fact implies that the magnetic field always have _____.

(a) double values at any point in space
(b) triple values at any point in space
(c) multiple values at any point in space
(d) a unique value at any point in space

Q84. In this question, a group of numbers is coded using letters/symbols as per the table given below, and the conditions that follow. The correct combination of codes following the conditions is your answer.

Number/digit	**9**	**5**	**1**	**7**	**3**	**4**	**8**	**6**	**2**
Code	B	K	L	D	^	$	#	&	F

Conditions.

1. If the first digit is odd and last digit is even, the codes for the first and the last digits are to be interchanged.

2. If the first digit is even and last digit is odd, both are to be coded by the code for the first digit.

What will be the code for 85624731?

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(a) #K&F$D^L
(b) #K&F$D^#
(c) #KF&$D^L
(d) #KF&D$^#

Q85. Select the correct balanced chemical equation for the given reaction.

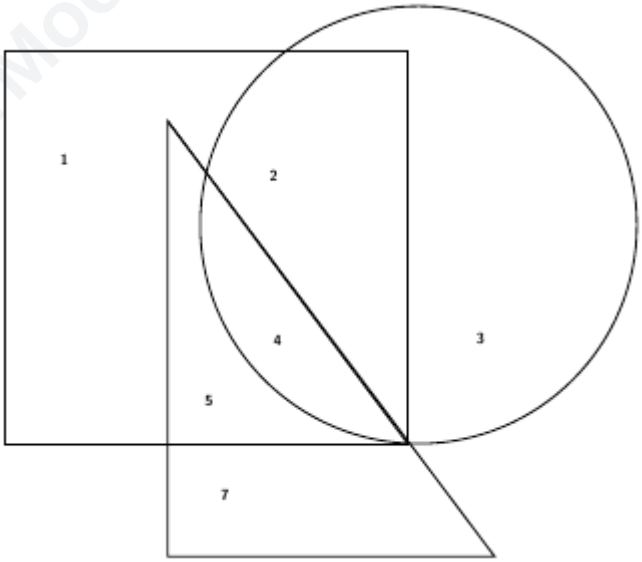
Magnesium(s) + Oxygen (g) → Magnesium oxide(s)

(a) Mg(s) + O2(g) → MgO2(s)
(b) 2Mg(s) + O2(g) → 2MgO(s)
(c) 2Mg(s) + O2(g) → 2MgO2(s)a
(d) Mg(s) + O2(g) → 2MgO(s)

Q86. Three numbers are co-prime to one another and the product of the first two and the last two are 432 and 945, respectively. Find the LCM of the three numbers.

(a) 14850
(b) 15030
(c) 16650
(d) 15120

Q87. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. The circle represents 'sports persons', the square represents 'coaches', and the triangle represents 'administrators'. How many sports persons are there who are also coaches but NOT administrators?



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

Q88. In this question, a statement is followed by two conclusions. Which of the two conclusions is/are true with respect to the statement?

Statement: E = A < T ≤ D > H > O < X

Conclusions:

I. D > E

II. D > O

(a) Neither conclusion I nor II is true
(b) Both conclusions I and II are true
(c) Only conclusion I is true
(d) Only conclusion II is true

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Q89. Which of the following statements about Mendeleev's periodic table is NOT correct?

(a) Noble gases were not discovered at that time.
(b) Like alkali metals, hydrogen reacts with halogen, oxygen, and sulphur to form compounds having similar formulae.
(c) No specific position was assigned to the isotopes in the Mendeleev's periodic table.
(d) Hydrogen was assigned a fixed position in the Mendeleev's periodic table.

Q90. The milestone of having how many open defecation-free (ODF) Plus villages has been crossed by India in March 2022?

(a) 50,000
(b) 40,000
(c) 30,000
(d) 60,000

Q91. Which additional duty was added in 2002 by the 86^(th) Amendment of the Constitution, under clause K of the fundamental duties of India?

(a) To safeguard public property and to abjure violence
(b) To value and preserve the rich heritage of our composite culture
(c) Who is a parent or guardian, to provide opportunities for education to his child or, as the case may be, ward, between the age of six and fourteen years.
(d) To defend the country and render national service when called upon to do so

Q92. Select the correct pair of semi-metals amongst the following elements.

(a) Carbon and nitrogen
(b) Sulphur and phosphorus
(c) Silicon and germanium
(d) Hydrogen and helium

Q93. In December 2021, in which city was the National Billiards Championship held?

(a) Bhopal
(b) Ranchi
(c) Mumbai
(d) Guwahati

Q94. A and B can complete a work in 10 days and 15 days, respectively. They started working together but after 3 days B had to leave and A alone completed the remaining work. In how many days in all was the entire work completed?

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

Q95. A man makes a monthly payment equal to 15% of his monthly salary towards debt repayment. He spends 75% of the remaining salary and saves Rs. 425. His monthly salary is:

(a) Rs. 2,400
(b) Rs. 1,800
(c) Rs. 2,000
(d) Rs. 2,200

Q96. An object of diameter 6 cm is placed at a distance of 10 cm in front of a lens with a power of +5.0 D. The diameter of the image of the object will be:

(a) 12 cm
(b) 10 cm
(c) 8 cm
(d) 14 cm

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Q97. If the magnification of an image from a spherical mirror is -1.38, then the nature of the image will be:

(a) virtual, erect and enlarged
(b) real, inverted and smaller
(c) real, inverted and enlarged
(d) virtual, erect and smaller

Q98. Ram bought a bulb rated as 50 W and 220 V. When it is connected to a 220 V supply, its resistance will be:

(a) 868 Ω
(b) 968 Ω
(c) 1098 Ω
(d) 1068 Ω

Q99. Which of the following is used to detect the presence of starch in food?

(a) Iodine solution
(b) Litmus solution
(c) Phenolphthalein
(d) Benedict's solution

Q100. In which of the following animals does the body temperature NOT depend on the temperature in the environment?

(a) Fishes and mammals
(b) Birds and some reptiles
(c) Birds and fishes
(d) Birds and mammals

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) 36 Ω

The correct answer is 36 Ω.

Key Points

Given:

Electric lamp resistance is 30 Ω and conductor resistance is 6 Ω which are connected in series to 6 V battery.

Formula:

For, resistors in series we have:

Rs=R1+R2+....+Rn

Calculations:

R1=30 Ω

R2=6 Ω

Rs=R1+R2=30+6=36Ω

Therefore, total resistance of the circuit is 36 Ω.

Q2. Answer: (a) 9108

Shortcut Trick

If a + b + c = 0, then $a^3 + b^3 + c^3 = 3abc$.

Check: 23 + (−11) + (−12) = 23 − 23 = 0.

Result = 3 × 23 × (−11) × (−12) = 3 × 23 × 132 = 69 × 132.

69 × 132 = 9108.

Therefore The correct answer is 9108.

Alternate Method

Given: a = 23, b = −11, c = −12.

Formula Used: $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$.

Calculations:

=> a + b + c = 23 + (−11) + (−12) = 0.

=> Since (a + b + c) = 0, the equation becomes $a^3 + b^3 + c^3 = 3abc$.

=> $23^3 + (-11)^3 + (-12)^3 = 3 \times 23 \times (-11) \times (-12)$.

=> 69 × (−11 × −12) = 69 × 132.

=> 69 × 132 = 9108.

Therefore The correct answer is 9108.

Additional Information

Algebraic Identity

The expression $a^3 + b^3 + c^3 - 3abc$ is zero whenever a + b + c = 0 or a = b = c.

Product of Three Numbers

Multiplying three numbers x, y, z where two are negative results in a positive value: (+) × (−) × (−) = (+).

Q3. Answer: (d) Interest received on loans

The correct answer is Interest received on loans.

Key Points

• Interest received on loans is not a capital receipt.

• Capital receipts are inflows of funds that result in an increase in the net worth of a business or organization.

• Revenue receipts are inflows of funds that result in an increase in the income of a business or organization.

Additional Information

• Examples of capital receipts include the sale of fixed assets, the sale of equity or debt securities, the receipt of loans or other forms of financing, and the recovery of loans that were previously made.

• Capital receipts are typically used to finance long-term investments or to fund other capital expenditures, such as the expansion of a business or the acquisition of new assets.

• Revenue receipts, on the other hand, are typically generated from the ongoing operations of a business and are used to fund the day-to-day expenses of the business, such as salaries, rent, and utilities. Examples of revenue receipts include sales of goods or services, rent or lease payments, and interest income.

Q4. Answer: (a) 27 : 22

Given:

Calculation:

Total number of girls in the year 2016 in both colleges

= 60 + 210

= 270

Total number of girls in the year 2019 in both colleges

= 70 + 150

= 220

Ratio of girls in the year 2016 and 2019 in both colleges

= 270 : 220

= 27 : 22

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Thus, the required ratio is 27 : 22.

Hence, the correct answer is option 1).

Q5. Answer: (d) Bluish green

The correct answer is Bluish green.

Key Points:

• Red cabbage

• A purple solution known as a red cabbage indicator determines if the product is acidic or basic.

• A solution that serves as pH indicator can be made using red cabbage, which is frequently available in homes.

• Flavin, often known as anthocyanin, is a pigment molecule found in cabbage that reacts with acidity to change the color.

• The purple solution typically changes colour when it reacts with an acid, turning red, and when it reacts with the base, changing colour to bluish-green.

• The material is mainly neutral if it does not alter the colour.

Additional Information:

• To determine how acidic or basic the solution is, use pH scale.

• It ranges from 0 to 14, with 7 serving as the neutral.

• Anything with a pH below 7 is considered an acid, whereas anything with pH over 7 is considered a base.

• A material with pH of 2 is 10 times more acidic than one with pH of 3.

• The pH scale is a logarithmic scale.

• As the pH of the solution drops, the amount of hydrogen ions in the solution rises.

Q6. Answer: (b) Karnataka

The correct answer is Karnataka.

Key Points:

• There are 1.10 million tonnes of Jet Black granite in the Kollegal region of Karnataka, which is split across Chamarajanagar, Mysore, and Mandya districts.

• Jet Black granite is used for flooring, decorative stones, and landscaping and is highly sought-after in the US, European, and Chinese markets.

• Karnataka was the leading exporter of granite before 1992, with a share of more than 50% of all exports.

• However, from 1993 to 1994, quarrying was prohibited in the Kollegal region due to the operations of the forest brigand Veerappan.

Additional Information:

• Granite is in high demand on the international market in the forms of rough-cuts, bush-hammered and charred slabs, paving tiles, wall panelling, stair treads and bathroom/kitchen unit tops.

• The state's granite potential has mainly gone untapped.

• The demand for granite ornaments is increasing internationally.

• Some of the strongest and most resilient stones in the world may be found in the charmokites of Tamil Nadu, Karnataka, and Andhra Pradesh.

Q7. Answer: (d) 2

The correct answer is 2.

Key Points:

• Between 1952 and 2020, two seats in the Lok Sabha, the lower house of the Indian Parliament, were reserved for Anglo-Indians.

• These two nominees were put forth by the Indian President at the government's suggestion.

• The President of India may propose no more than two members of the Anglo-Indian community if, in his/her judgement, that community is not sufficiently represented in the House.

Confusion Points

• The Anglo-Indian reserved seats in the Indian Parliament and State Legislatures disappeared in January 2020 thanks to the 126th Constitutional Amendment Bill of 2019, which was signed into law as the 104th Constitutional Amendment Act, 2019.

• At the time of the Indian Constitution's ratification, Article 331 provided the Anglo-Indian community a reserve; however, this reservation would end ten years after the Constitution's inception.

Additional Information:

• The Anglo-Indian community was the only one in India to nominate candidates for the Lok Sabha, or lower chamber, of the Indian Parliament.

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• Jawaharlal Nehru granted this authority to Frank Anthony, the All India Anglo-Indian Association's first and longest-serving president.

• The representatives of the community were two people.

• This was carried out since the town lacked a native state of its own.

• Each of the 14 Indian states (Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Telangana, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal) also had a nominated representative in their respective State Legislative Assemblies.

Q8. Answer: (d) The Karve Committee

The correct answer is "The Karve Committee".

Key Points

• The Karve Committee

• In 1955, a small-scale industrial committee was established.

• Another name for it was a Karve committee.

• It was given the name Dattatreya Gopal Karve in honor of the professor and economist from India who made significant contributions to public policy, cooperative movements, and economics.

• The Karve Committee was established in 1955 to promote the development of small-scale companies.

Additional Information

• Kothari Commission

• The Government of India established the National Education Commission, also known as the Kothari Commission, as an ad hoc commission with the mandate to review all facets of the Indian educational system, create a general framework for education, and suggest rules and policies for the advancement of education in the country.

• Abid Hussain Committee

• On small-scale industries and Exim policy, the Abid Hussain Committee was appointed.

• The Nayak Committee

• The Reserve Bank of India established a Committee on December 9 under Deputy Governor Shri P.R. Nayank to investigate the challenges that small-scale industries (SSI) face while trying to secure financing.

Q9. Answer: (c) Development Authority

Development Authority is NOT correct.

• Development Authority is not a part of the Local Government in India.

• Development Authority means a person or body appointed as a Development Authority as contemplated by and in accordance with the Municipal Government Act.

• It was envisaged that the development authorities would help in planning, implementing and coordinating development activities in a structured manner.

• The actual implementation of urban projects and master plans has started after the formation of the Urban Development Authorities.

Key Points

• Local government in India refers to the government jurisdiction below the state level.

• A uniform three-tier structure of

• panchayats at village (Gram Panchayat - GP),

• intermediate or block (Panchayat Samiti - PS) and

• district (Zilla Parishad - ZP) levels.

• All the seats in the Panchayat at each level are to be filled by election from the respective regional constituencies.

Additional Information

• India is a federal republic with three regions of government: central, state and local.

• The 73rd and 74th Constitutional Amendments provide recognition and protection to local governments and in addition, each state has its own local government legislation.

• Since 1992, local government in India takes place in two different forms.

• Urban areas covered by the 74th Amendment to the Constitution have municipalities, but they derive their powers from individual state governments, while the powers of rural areas have been formalized under the Panchayati Raj system under the 73rd Amendment to the Constitution.

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Q10. Answer: (c) virus

The correct answer is virus.

Key Points:

• Warts

• Small bumps called warts frequently appear on the skin of the hands and the feet.

• Warts can seem different and might grow singly or in groups.

• Some have a higher propensity to affect certain body parts.

• Though warts are not malignant, they can resemble several types of cancer.

• The human papillomavirus infection is what causes warts (HPV).

• The virus makes the top layer of the skin that generates an excessive quantity of keratin, a tough protein (epidermis).

• The additional keratin gives the wart its rough, hard texture.

Additional Information:

• Warts are transferred by intimate skin-to-skin contact even though they aren't regarded to be very contagious.

• The virus can also spread indirectly through contaminated surfaces or items, such as the area around a swimming pool.

• Your risk of infection increases if your skin is damaged or wet.

• After contracting the infection, a wart or verruca may not appear for several weeks or even months.

Q11. Answer: (a) 3

According to given information,

The third element from the right end of the given series is 9

(Left) 6 % 7 & 9 4 3 @ 2 8 * 3 # 9 & 2 (Right)

And,

The fourth element from the left end of the given series is &

(Left) 6 % 7 & 9 4 3 @ 2 8 * 3 # 9 & 2 (Right)

There are total 3 symbols between the third element from the right end and the fourth element from the left end of the given series i.e. @, *, #

(Left) 6 % 7 & 9 4 3 @ 2 8 * 3 # 9 & 2 (Right)

Hence, "Option 1" is the correct answer.

Q12. Answer: (d) DigiSaksham

The correct answer is "DigiSaksham".

Key Points

• This digital skills program was started with the intention of promoting youth employability by enhancing their digital abilities, which have become crucial in today's increasingly technologically advanced world.

• Microsoft India and the Ministry of Labor and Employment collaborated on Digi Saksham.

• It is a continuation of the government's continuous initiatives to assist young people in rural and semi-urban areas.

• "Aga Khan Rural Support Programme India (AKRSP-I)" is the organization that will carry out the program on the ground.

Additional Information

• More than 3 lakh youth will receive free training in digital skills, including fundamentals and advanced computers, as part of the DigiSaksham program in the first year.

• The National Career Service (NCS) Portal is the place where you can access this training program.

• The campaign prioritizes hiring semi-urban job seekers from underserved communities who have lost their jobs due to the ongoing COVID-19 pandemic.

Q13. Answer: (a) 34

Given:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
P	45	40	28	48	20	20	24
Q	92	90	12	27	16	26	98
R	36	80	13	30	38	47	62
S	46	60	64	12	52	76	34

T	18	48	69	58	80	15	10

Calculation:

Number of Air coolers sold by the store Q on Thursday

= 27

Number of Air coolers sold by the store T on Saturday

= 15

Number of Air coolers sold by store S on Tuesday

= 60

Average of above three

= (27 + 15 + 60)/3

= 102/3

= 34

Thus, the required value is 34.

Hence, the correct answer is option 1).

Q14. Answer: (b) 40

Shortcut Trick

Ratio of ages 5 years ago = 7 : 1 (Gap = 6 units)

Ratio of ages 5 years hence = 3 : 1 (Gap = 2 units)

Equating gaps: 5 years ago = 7 : 1 | 5 years hence = 9 : 3

Difference (9 − 7) = 2 units → 10 years (5 ago to 5 hence)

1 unit = 5 years => Ramesh 5 years ago = 7 × 5 = 35 years

Therefore The correct answer is 40 years.

Alternate Method

Let the present age of Ramesh be R and his son be S.

Given:

Case 1 (5 years hence): R + 5 = 3 × (S + 5)

Case 2 (5 years ago): R − 5 = 7 × (S − 5)

Calculations:

=> From Case 1: R − 3S = 10 ... (i)

=> From Case 2: R − 7S = −30 ... (ii)

=> Subtracting (ii) from (i): 4S = 40

=> S = 10 years

=> Substitute S in (i): R − 3(10) = 10

=> R − 30 = 10

=> R = 40 years

Therefore The correct answer is 40 years.

Additional Information

Ratio Difference Method

When the time gap between two ratios is constant, we multiply ratios by the difference of the other ratio to equalize the units of age change.

Age Problems Logic

The difference between the ages of two people remains constant throughout their lives, regardless of the number of years passed.

Equation Balancing

Always ensure to add or subtract years from both parties when moving forward or backward in time (e.g., n years hence = Age + n).

Q15. Answer: (a) Nine

According to the given information,

• Adya is heavier than Dilipa

• Adya is lighter than fiya

Fiya > Adya > Dilipa

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• Bidan is heavier than Fiya
• Charu is heavier than Bidan
• Charu is lighter than Esha
Esha > Charu > Bidan > Fiya > Adya > Dilipa
• Only one student is heavier than Esha.
• Only two students are lighter than Dilipa
A > Esha > Charu > Bidan > Fiya > Adya > Dilipa > B > C
There are 9 total students in the group.
Hence, "Option 1" is the correct answer.

Q16. Answer: (c) 21

Concept used:
BODMAS
Preference will be given on the basis of the letters coming first in the word Bodmas.
Calculation:
23.96 + 24.96 + 23.16 - 18.89 × 3.04 + 36.13 ÷ 6.1
Taking appro×imation: 24 + 25 + 23 - 19 × 3 + 36 ÷ 6
= 24 + 25 + 23 - 57 + 6 = 21
Thus, the required closest value is 21.
Hence, the correct answer is option 3).

Q17. Answer: (c) 73.92

Shortcut Trick
Original Speed = 100% = 84 km/h
Reduced Speed = 100% − 12% = 88%
New Speed = 84 × 0.88
New Speed = 73.92 km/h
Therefore The correct answer is 73.92 km/h.
Alternate Method
Given:
Initial Speed of the bus = 84 km/h
Percentage Reduction in speed = 12%
Calculations:
=> Reduction in speed = 12% of 84
=> Reduction = (12 ÷ 100) × 84
=> Reduction = 0.12 × 84 = 10.08 km/h
=> New Speed = Initial Speed − Reduction
=> New Speed = 84 − 10.08
=> New Speed = 73.92 km/h
Therefore The correct answer is 73.92 km/h.
Additional Information
Percentage Change Formula
New Value = Original Value × (100 ± Change%) ÷ 100. Use ± for increase or decrease.
Speed Conversion
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.
Successive Percentage
If speed changes by a% and then b%, effective change = [a + b + (a × b)/100]%.

Q18. Answer: (b) Rajasthan

The correct answer is "Rajasthan".
Key Points
• Summer, which lasts from April through June in Rajasthan, is the hottest of all seasons.
• Rajasthan experiences extremely hot summers with temperatures averaging between 32 and 46 degrees Celsius.

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• The environment is typically 38 degrees Celsius.
• Mt Abu is the only location in the state with a lower temperature this time of year.
• During the day, scorching winds from the west are known as "Loo" winds.
Additional Information
• Assam:
• The northeastern Indian state of Assam is renowned for its biodiversity, historical landmarks, and tea plantations.
• The largest city in Assam, Guwahati, is located in the west and is home to the hilltop Kamakhya Temple and silk bazaars.
• Maharashtra:
• Maharashtra is a state in western India's peninsula that takes up a sizable chunk of the Deccan Plateau.
• Maharashtra is the second-most populous country subdivision in the world as well as the second-most populous state in India.
• Telangana:
• A state in southern India is called Telangana.
• The Charminar, a 16th-century mosque in Hyderabad's capital, has four arches that support four enormous minarets.
• The monument offers a view of the city's venerable Laad Bazaar.

Q19. Answer: (a) 2,72,250

Shortcut Trick
Net percentage increase for two successive decades of 10% each = 10 + 10 + (10 × 10)/100 = 21%.
Population in 2000 = 2,25,000 × 121%.
Population in 2000 = 2,250 × 121 = 2,72,250.
Therefore The correct answer is 2,72,250.
Alternate Method
Given:
Initial Population (P) in 1980 = 2,25,000
Rate of increase (R) = 10% per decade
Time period (n) = 1980 to 2000 = 2 decades
Formula Used:
Final Population = $P \times (1 + R/100)^n$
=> Population in 1990 = 2,25,000 × (110/100) = 2,47,500
=> Population in 2000 = 2,47,500 × (110/100)
=> Population in 2000 = 2,475 × 110
=> Population in 2000 = 2,72,250
Therefore The correct answer is 2,72,250.
Additional Information
Successive Percentage Change
If a value is increased by x% and then by y%, the net percentage change is given by [x + y + (xy/100)]%.
Population Depreciation
If the population decreases at a rate R, the final population is calculated as $P \times (1 - R/100)^n$.
Multiplying Factor
For a 10% increase, the multiplying factor is 1.1. For two such increases, it is 1.1 × 1.1 = 1.21.

Q20. Answer: (d) P F D Z K N

Given Table :

Number/ symbol	**•**	**2**	**@**	**5**	**^**	**•**	**7**	**#**	**%**	**9**
Letter code	J	P	A	F	D	N	R	K	M	Z

According to Given series + 5 ^ 9 # 2 Condition 1 will be used
If the first element is a symbol and the last, is a number, the codes for these two (the first and the last elements) are to be interchanged.
So, Code will be

Number/symbol	•	5	^	9	#	2
Letter code	P	F	D	Z	K	N

Thus, PFDZKN is the required code.

Hence, "Option 4" is the correct answer.

Q21. Answer: (c) Three

Given series: (Left) Q A Y S R E Z I L X B O P A R D I H O U K (Right)

Required pattern: Vowel → Consonant → Vowel

So, There are 3 consonants are there, each of which is immediately preceded by a vowel and also immediately followed by a vowel.

Hence, "Option 3" is the correct answer.

Q22. Answer: (d) 905 1/7 cm3

Shortcut Trick

Radius (r) = Diameter ÷ 2 = 12 ÷ 2 = 6 cm.

Volume = (4/3) × (22/7) × 6^3 = (4/3) × (22/7) × 216.

=> 4 × (22/7) × 72 = 6336 ÷ 7 = 905 (1/7) cm^3.

Therefore The correct answer is 905 1/7 cm^3.

Alternate Method

Given:

Diameter (d) of the sphere = 12 cm

π = 22/7

Formula Used:

Radius (r) = d/2

Volume (V) = (4/3)πr^3

Calculations:

=> Radius (r) = 12 ÷ 2 = 6 cm

=> Volume = (4/3) × (22/7) × $(6)^3$

=> Volume = (4/3) × (22/7) × 216

=> Volume = 4 × (22/7) × 72

=> Volume = 6336 ÷ 7

=> Volume = 905 (1/7) cm^3

Therefore The correct answer is 905 1/7 cm^3.

Additional Information

Surface Area of Sphere

The total surface area of a sphere is given by the formula $4\pi r^2$.

Volume of Hemisphere

The volume of a hemisphere is exactly half of a sphere: (2/3)πr^3.

Total Surface Area of Hemisphere

For a solid hemisphere, the total surface area is $3\pi r^2$ (curved surface + base area).

Q23. Answer: (c) Only conclusion I is true

Given statement: Q < A < B ≤ C > D > E ≥ F

I. F < C → True (as F ≤ E < D < C)

II. D < A → False (as A < B ≤ C > D not possible)

Only conclusion I is true.

Hence, "Option 3" is the correct answer.

Q24. Answer: (a) 9

Given number: 56137428

After arranging in ascending order from left to right the number will be: 12345678

The digits which are second from the left is 2 : 12345678

And second from the right is 7 : 12345678

The sum of the digits which are second from the left and second from the right in the new number is 2 + 7 = 9

Hence, "Option 1" is the correct answer.

Q25. Answer: (b) 5, 2

Shortcut Trick

Convert to standard quadratic equation form: $x^2 - 7x + 10 = 0$.

Identify the Sum of roots $(-b/a) = 7$ and Product of roots $(c/a) = 10$.

Check the options to find two numbers that satisfy both conditions.

For 5 and 2: Sum = 5 + 2 = 7 and Product = 5 × 2 = 10.

Therefore The correct answer is 5, 2.

Alternate Method

Given: The equation is $x + 10/x = 7$.

Method: Standard algebraic factorization.

$\Rightarrow x + 10/x = 7$

$\Rightarrow (x^2 + 10) / x = 7$

$\Rightarrow x^2 + 10 = 7x$

$\Rightarrow x^2 - 7x + 10 = 0$

$\Rightarrow x^2 - 5x - 2x + 10 = 0$

$\Rightarrow x(x - 5) - 2(x - 5) = 0$

$\Rightarrow (x - 5)(x - 2) = 0$

$\Rightarrow x - 5 = 0$ or $x - 2 = 0$

$\Rightarrow x = 5$ or $x = 2$

Therefore The correct answer is 5, 2.

Additional Information

Quadratic Formula

For any equation $ax^2 + bx + c = 0$, the roots can be found using $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$.

Nature of Roots

The discriminant $D = b^2 - 4ac$ determines the type of roots: if $D > 0$, roots are real and distinct; if $D = 0$, roots are real and equal; if $D < 0$, roots are imaginary.

Relationship between Roots and Coefficients

The Sum of roots $(\alpha + \beta)$ is always $-b/a$ and the Product of roots $(\alpha\beta)$ is always c/a.

Q26. Answer: (b) 32

The logic followed here is:

The difference between the odd terms is +6 & the difference between the even terms is +6.

Hence, the correct answer is Option 2.

Q27. Answer: (d) 0.35

Given:

4515 ÷ 12.9 = 350

Calculation:

4515 ÷ 12.9 = 350

$\Rightarrow 4515/12.9 = 350$

$\Rightarrow (4.515 \times 1000)/(12.9) = 350$

$\Rightarrow 4.515/12.9 = 350/1000$

$\Rightarrow 4.515/12.9 = 0.35$

Thus, the required value is 0.35.

Hence, the correct answer is option 4).

Q28. Answer: (b) (13, 7, 85)

Logic: First number × Second number - 6 = Third number

(12, 8, 90) → 12 × 8 - 6 => 96 - 6 = 90

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and,

(8, 8, 58) → 8 × 8 - 6 => 64 - 6 = 58

Similarly,

(13, 7, 85) → 13 × 7 - 6 => 91 - 6 = 85

Hence, "Option 2" is the correct answer.

Q29. Answer: (b) 10^(th)

The correct answer is "10th".

Key Points

• A population that identifies as Sikh as well as a select group of initiated Sikhs are both referred to as Khalsa.

• The Tenth Guru of Sikhism, Guru Gobind Singh, founded the Khalsa tradition in 1699.

• Its founding was a significant occasion in Sikhism's history.

• Sikhs commemorate the foundation of Khalsa during the Vaisakhi holiday.

Additional Information

• Among the Dogras, Vaisakhi is also pronounced as Baisakhi.

• It is customarily observed every year on the first day of the month of Vaisakh, marking both the beginning of the month of Vaisakh and the new year of the Dogra calendar.

• In Northern India specifically, it is seen as a celebration of the spring harvest.

• Beyond its significance as the harvest festival, when Sikhs hold kirtans, visit nearby Gurdwaras, participate in community fairs, hold nagar kirtan processions, hoist the Nishan Sahib flag, and come together to socialize and share festive foods.

• Baisakhi commemorates significant historical occurrences in Sikhism and the Indian subcontinent that took place in the Punjab region.

• The Khalsa order was founded on April 13, 1699, by Guru Gobind Singh, the tenth Guru of Sikhism, and is commemorated by the major Sikh festival of Vaisakhi.

Q30. Answer: (d) Sand dune

The correct answer is "Sand dune".

Key Points

• Wind that primarily blows in one direction creates the crescent-shaped sand dune known as Barchan, often spelt Barkhan.

• It can be found in sandy deserts all over the world.

• It is one of the most prevalent types of dunes.

Additional Information

• These sand dunes feature a very uneven cross-section, with a much sharper slope known as the slip face facing the wind and a much softer slope facing the opposite direction.

• The barchans' crescent-shaped horns, which are convex and point into the wind to show how the sand is moving horizontally.

• At its bottoms, Barchans can have heights of 9 to 30 metres (30 to 100 feet) and widths of 30 to 370 metres (1,214 to 1,214 feet).

Q31. Answer: (d) 22.22%

Shortcut Trick

Use the direct relationship formula: MP ÷ CP = (100 + Profit%) ÷ (100 − Discount%).

Ratio MP : CP = (100 + 10) : (100 − 10) = 110 : 90 = 11 : 9.

Marked-up value = 11 − 9 = 2 units.

Markup percentage = (2 ÷ 9) × 100 = 22.22%.

Therefore The correct answer is 22.22%.

Alternate Method

Given: Discount = 10%, Profit = 10%.

Formulas: SP = CP × (100 + Profit%) ÷ 100 | SP = MP × (100 − Discount%) ÷ 100 | Markup% = (MP − CP) ÷ CP × 100

=> Let Cost Price (CP) = 100.

=> Since Profit is 10%, Selling Price (SP) = 100 + 10 = 110.

=> This SP is obtained after a 10% discount on Marked Price (MP). So, 0.90 × MP = 110.

=> MP = 110 ÷ 0.90 = 1100 ÷ 9 = 122.22.

=> Markup Percentage = ((122.22 − 100) ÷ 100) × 100 = 22.22%.

Therefore The correct answer is 22.22%.

Additional Information

Relation between MP and CP

The ratio of Marked Price to Cost Price can always be expressed as (100 + Profit%) / (100 − Discount%).

Marked Price vs Selling Price

Marked Price is the price printed on the label, while Selling Price is the final amount paid after deducting the Discount.

Q32. Answer: (c) 35 meters West

We have drawn the figure according to the information given in the question,

Distance between office and car parking area = 20 + 15 = 35 meters.

And Shiv is in the West direction where he parked his car from the office.

Hence, "Option 3 " is the correct answer.

Q33. Answer: (d) Indira Gandhi canal

The correct answer is "Indira Gandhi canal".

Key Points

• An important irrigation canal in India is the Indira Gandhi Canal.

• It begins in Punjab's Firozpur and ends with irrigation systems in Rajasthan's Thar Desert.

• Seven districts in Rajasthan are traversed by the canal: Barmer, Bikaner, Churu, Hanumangarh, Jaisalmer, Jodhpur, and Sriganganagar. Thus, Rajasthan now has more greenery.

Additional Information

• Indira Gandhi canal

• The project formerly known as the Indira Gandhi canal was given a new name in her honour.

• The Indira Gandhi Canal project was started in 1983 and finished in 2010 when Manmohan Singh was the prime minister of India.

• The Indira Gandhi Canal, which has a length of 445 km, was constructed to start agricultural operations in Rajasthan's fields.

• The Indira Gandhi Canal connects Punjab and Rajasthan over its length and was constructed using the Sutlej and Beas rivers.

Q34. Answer: (a) B

Given word: FRANTIC

Each vowel in the word FRANTIC is changed to the letter following it in the English alphabetical order So, the vowels in the word are 2 i.e. A, and I.

After changing, the word will be: FRBNTJC

And each consonant in the word FRANTIC is changed to the letter preceding it in the English alphabetical order. So, consonants in the word are 5 i.e. F, R, N, T, C

After changing, the word will be: EQBMSJB.

B letter will appear twice in the group of letters thus formed.

Hence, "Option 1" is the correct answer.

Q35. Answer: (c) 0

Calculation:

According to the question,

[(ka)b-c × (kb)c-a × (kc)a-b] × (x0 - 1)

= [(ka)b-c × (kb)c-a × (kc)a-b] × (1 - 1)

= [(ka)b-c × (kb)c-a × (kc)a-b] × 0

= 0

Thus, the required value is 0.

Hence, the correct answer is option 3).

Q36. Answer: (b) 12

Shortcut Trick

Sum of ages 4 years ago = 20 − (4 × 2) = 12 years.

Ratio of Brijesh : William (4 years ago) = 1 : 2.

Total ratio units = 1 + 2 = 3 units.

3 units = 12 years => 1 unit = 4 years.

William's age 4 years ago = 2 units = 8 years.

William's present age = 8 + 4 = 12 years.

Therefore The correct answer is 12 years.

Alternate Method

Given:

Sum of present ages of William (W) and Brijesh (B) = 20 years.

Condition: 4 years ago, Brijesh's age was half of William's age.

Formula used:

Sum of ages = Age1 + Age2

Age 'n' years ago = Present Age − n

Calculations:

=> W + B = 20 => B = 20 − W

=> 4 years ago: B − 4 = (W − 4) ÷ 2

=> 2 × (B − 4) = W − 4

=> 2 × (20 − W − 4) = W − 4

=> 2 × (16 − W) = W − 4

=> 32 − 2W = W − 4

=> 32 + 4 = W + 2W

=> 36 = 3W

=> W = 36 ÷ 3 = 12

Therefore The correct answer is 12 years.

Additional Information

Constant Age Difference

The difference between the ages of two people always remains constant, regardless of how many years pass or go by.

Age Ratio Property

If the ratio of ages of A and B is x : y, then their ages can be assumed as xk and yk, where k is a common constant.

Sum of Ages Change

If there are 'n' people, the sum of their ages increases or decreases by n × t after or before 't' years.

Q37. Answer: (b) 3

The Venn Diagram is given below :

The highlighted portion represents philanthropists who are NEITHER men NOR doctors.

3 philanthropists are NEITHER men NOR doctors.

Hence, "Option 2" is the correct answer.

Q38. Answer: (a) 10,000

The correct answer is 10000.

Key Points:

• The "Scheme for Protection and Preservation of Endangered Languages of India" was started by the Indian government (SPPEL).

• The Central Institute of Indian Languages (CIIL), Mysore, works on the conservation, recording, and preservation of all Indian mother tongues and endangered languages that are spoken by fewer than 10,000 people nationwide.

• 117 endangered languages and mother tongues from all over India have been selected for study and recording in the scheme's initial phase on the basis of priority.

• The University Grants Commission (UGC) has also launched two programs for the protection of endangered languages, namely "Establishment of Centres for Endangered Languages in Central Universities" and "Funding Support to the State Universities for Study and Research in Indigenous and Endangered languages in India."

• A total of Rs. 45.89 crores were made available by the UGC and CIIL between 2015–16 and 2019–20 under their programs for the preservation of endangered Indian languages.

Additional Information:

• As a means of communication and self-expression, language is a crucial component of any culture.

• Future generations lose a critical component of the culture that is required to fully comprehend it when a language is lost to extinction.

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• Due to this, language is now a particularly vulnerable piece of cultural heritage, making its preservation even more crucial.

• According to statistics from the United Nations Educational, Scientific, and Cultural Organization ("Atlas of Languages in Danger of Disappearing"), there are an estimated 7,000 languages spoken worldwide today, with the eight most frequent languages being spoken by half of the world's population.

Q39. Answer: (d) 660 W

The correct answer is option 4)660W

Given:

R1=10Ω,R2=20Ω,R3=30Ω are in parallel with a battery of 60 V connected with it

Formula:

For resistors in parallel: 1/Rp=1/R1+1/R2+1/R3

and Power is P=(V^2)/R

Calculations:

1/Rp=1/R1+1/R2+1/R3

1/Rp=1/10+1/20+1/30

1/Rp=(6+3+2)/60=11/60

Therefore, Rp=60/11.

Now, P=(V^2)/R

P=(60^2)/(60/11)

P=(3600*11)/60=60*11=660W

Therefore, the net power consumed is 660W.

Q40. Answer: (c) -3

The logic followed here is:

The difference between the odd terms is +2 & the difference between even terms is -2.

Hence, the correct answer is Option 3.

Q41. Answer: (d) 30

Shortcut Trick

Multiply each marks obtained by its frequency (no. of students) and sum them up.

Total Marks = (25 × 5) + (30 × 6) + (35 × 3) + (40 × 1) = 125 + 180 + 105 + 40 = 450.

Total Students = 5 + 6 + 3 + 1 = 15.

Mean = 450 ÷ 15 = 30.

Therefore The correct answer is 30 marks.

Alternate Method

Given:

Marks (x): 25, 30, 35, 40

Frequency (f): 5, 6, 3, 1

Formula Used:

Mean (x) = $\Sigma f_i x_i \div \Sigma f_i$

Calculations:

=> Total Students (Σf) = 5 + 6 + 3 + 1 = 15

=> Total Marks (Σfx) = (25 × 5) + (30 × 6) + (35 × 3) + (40 × 1)

=> Σfx = 125 + 180 + 105 + 40 = 450

=> Mean = 450 ÷ 15

=> Mean = 30

Therefore The correct answer is 30 marks.

Additional Information

Arithmetic Mean

The Arithmetic Mean is the average of a set of numerical values, calculated by dividing the sum of values by the count of values.

Assumed Mean Method

Used for larger data sets: Mean = A + (Σfd ÷ Σf), where A is the assumed mean and d = x − A is the deviation.

Properties of Mean

If every value in the data set is increased or decreased by a constant, the mean also increases or decreases by that same constant.

Q42. Answer: (c) Aditya

Six persons, Aditya, Binod, Chaya, Dilshan, Estar and Fatima

Months : January, March, May, July, September and November.

• None of them travelled after Binod it means Binod travels in November.

• Binod travelled immediately after Chaya.

Months	Person
January	
March	
May	
July	
September	Chaya
November	Binod

• Only three people travelled before Estar.

• Aditya travelled immediately after Fatima.

• Dilshan did not travel in the month of May.

Months	Person
January	Dilshan
March	Fatima
May	Aditya
July	Easter
September	Chaya
November	Binod

Aditya travelled in the month of May.

Hence, "Option 3" is the correct answer.

Q43. Answer: (b) A

Six persons, A, B, C, D, E and F

Months : January, March, May, July, September and November.

• None of them travelled after B it means B travels in the november

• B Travels just after C

Months	People
January	
March	
May	
July	
September	C
November	B

• Only three people travelled before E.

• A travelled just after F.

• D did not travel in the month of May.

Months	People

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January	D
March	F
May	A
July	E
September	C
November	B

A travelled in month of May.

Hence, "Option 2" is the correct answer.

Q44. Answer: (d) 14 u

The correct answer is 14 u.

Key Points:

• homologous series

• A homologous series is made up of substances with the same functional group and similar chemical properties.

• A homologous series' members are referred to as homologs.

• A -CH2 group distinguishes the following members of a homologous series from one another.

• A -CH2 group has a molecular mass of 14 amu.

• As a result, the mass of each succeeding homologue in a homologous series varies by 14 amu.

Additional Information:

• Methane (CH4) is followed by ethane (C2H6), propane (C3H8), butane (C4H10), and pentane (C5H12) in the homologous series of straight-chained alkanes.

• In that series, each new methylene bridge (-CH2- unit) introduced in the chain causes the subsequent members to differ in mass.

• As a result, each member's molecular mass varies by 14 atomic mass units.

• "Adjacent homologues" are members of such a series that are close to one another, such as methane and ethane.

• Numerous physical characteristics in that series, such as the boiling point, gradually alter with increasing mass.

• Ethane (C2H6), for instance, has a higher boiling point than methane (CH4).

Q45. Answer: (b) the small intestine

The correct answer is the small intestine.

Key Points:

• Small intestine

• The small intestine entirely digests proteins, lipids, and carbohydrates.

• It receives the liver and pancreatic fluids for this purpose.

• The three parts of the small intestine are the duodenum, jejunum, and ileum.

• The substance that enters the duodenum through the pyloric end of the stomach is known as chyme (acidic).

• The small intestine is where ingested macromolecules are fully digested.

• The contents of the stomach are absorbed by the small intestine before entering the bloodstream.

Additional Information:

• The stomach:

• Pepsin from the stomach and trypsin and chymotrypsin from the pancreas are the three main enzymes that break down dietary proteins into polypeptides in the stomach and duodenum.

• Different exopeptidases and endopeptidases subsequently break these polypeptides down into amino acids.

• The rectum:

• The rectum's duties include collecting stool from the colon, alerting you to the presence of stool, and holding the stool until evacuation occurs.

• The large intestine:

• The large intestine's function is to absorb water and salt from food that hasn't been completely digested as well as to expel any leftover trash.

• By the time food and digestive juices hit your big intestine, the majority of digestion and absorption have already taken place.

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Q46. Answer: (b) Sonali Bank Ltd.

The correct answer is Sonali Bank Ltd.

Key Points:

• There are 1230 branches total for Sonali Bank.

• The Dinajpur Board Branch branch is the most recent to begin operations.

• 67 of them are in urban areas, 746 are in rural areas, and two are abroad.

• For the purpose of facilitating remittances in foreign currencies, it also runs the Sonali Exchange Company Inc. in the USA, Sonali Exchange in Dubai (UAE), Sonali Bank (UK) Ltd. in the United Kingdom, Hong Kong (HAR), and Singapore.

• Including Dhaka, Chittagong, Sylhet, Moulvibazar, Beanibazar, Balaganj, Biswanath, Jagannathpur, Sunamganj, Gopalganj, Nabiganj Upazila, Hobigonj, Kulaura, Tajpur, Sonali Bank UK sends money directly to up to 25 locations in Bangladesh.

• The Reserve Bank of India claims that Sonali Bank is a foreign bank operating in India.

Additional Information:

• By combining and nationalizing the National Bank of Pakistan, Bank of Bahawalpur, and Premier Bank branches that had been located in East Pakistan before the 1971 Bangladesh Liberation War, Sonali Bank was founded in 1972 under the Bangladesh Banks (Nationalisation) Order.

• Sonali Bank had a paid-up capital of 30 million taka when it was founded.

• Dr. Atiur Rahman was a director of Sonali Bank from 1996 to 1999.

• In 2001, it had a paid-up capital of Tk 3.272 billion and an authorized capital of Tk 10 billion.

• Its authorized and paid-up capital are currently 10 and 9 billion Bangladeshi taka, respectively.

• On June 30, 2000, the bank's reserve funds were Tk 2.050 billion, up from Tk 60 million on June 30, 1979.

Q47. Answer: (b) 6

Given:

$3 + 3 \times [\{11 - 2\} \div 3] - 2 \times 3$

Concept used:

BODMAS

Preference will be given on the basis of Letters coming first in the word Bodmas.

Calculation:

$3 + 3 \times [\{11 - 2\} \div 3] - 2 \times 3$

$= 3 + 3 \times [\{9\} \div 3] - 2 \times 3$

$= 3 + 3 \times [3] - 6$

$= 3 + 9 - 6$

$= 12 - 6$

$= 6$

Thus, the required value is 6.

Hence, the correct answer is option 2).

Q48. Answer: (b) +3

The correct answer is option 2)+3

Given:

f=-18cm

u=-12cm

Formula:

Mirror formula: 1/f=1/u+1/v

Magnification: m=(-v)/u

Calculations:

1/f=1/u+1/v

1/(-18)=1/(-12)+1/v

1/v=1/12-1/18

1/v=(18-12)/(12*18)=6/216

v=216/6=36cm

Therefore, we have m=(-v)/u

m=(-(36))/(-12)=+3

Thus, the magnification produced by the mirror is +3.

Q49. Answer: (b) Only A

The correct answer is Only A.

Key Points:

• The output and equilibrium price will both shift in the same direction in response to changes in demand.

• A fall in demand will result in a decrease in a good's equilibrium price and quantity.

• At the original price, there is an excess supply due to the decline in demand.

• Price will drop due to the oversupply, and as a result, producers will be ready to create less of the good, reducing output.

• A rise in demand will result in an increase in a good's equilibrium price and output.

• Excess demand arises at the starting price as a result of the growth in demand.

• The price will increase (inflationary gap) due to excessive demand, and as the price increases, manufacturers will be more inclined to sell, boosting output.

Additional Information:

• Equilibrium price and output will move in opposite directions as a result of a change in supply.

• A decrease in the equilibrium price and a rise in the equilibrium quantity of an item will result from an increase in supply.

• At the starting price, the increase in supply results in an excess supply.

• A surplus of supply lowers the price and raises the quantity sought.

• An increase in equilibrium price and a drop in the equilibrium quantity of a good will result from a decrease in supply.

• At the starting price, there is an excess demand due to the decrease in supply.

• The price rises and the quantity requested declines as a result of excessive demand.

Q50. Answer: (b) 7

Circle = Hockey

Square = Golf players

Triangle = Badminton players

Persons who play golf, hockey, and Badminton are 3 + 7 = 10

And persons who play both golf and hockey but NOT badminton are 10 - 3 = 7

Hence, "Option 2" is the correct answer.

Q51. Answer: (b) Cannot be composted

The Correct Answer is Cannot be composted.

Key Points

• Biodegradable plastics can decompose naturally in the environment, giving an end product that is less harmful and can also be easily recycled through an organic process.

• Biodegradable plastics consume less energy during their manufacture, even though their production requires more investment. Hence, reduction of environmental pollution.

• Biodegradable plastics break down easily and can be absorbed by the soil or converted into compost. Even if a complete breakdown does not occur, it helps in achieving a reduction in the amount of space required to dispose of plastic waste.

• Biodegradable plastics lessen the amount of greenhouse gas emissions. Their decomposition does not release harmful products.

Additional Information

• There is a risk of contamination as the crops are typically sprayed with pesticides and can easily be transferred or included in the end product.

• There is a need for costly equipment, industrial processors, and composters.

• Some biodegradable plastics may produce methane when decomposing in landfills, it can accelerate climate change.

• Biodegradable Plastics need to be disposed of in very particular methods and require water to decompose properly, to ensure proper and timely decomposition.

Q52. Answer: (c) 28

Shortcut Trick

Area of rectangle = Length × Breadth = 1400 m².

Difference between Length and Breadth = 22 m.

Test options for Breadth (b): If b = 28, then Length (l) = 28 + 22 = 50.

Product: 50 × 28 = 1400. This matches the given area.

Therefore The correct answer is 28 m.

Alternate Method

Given: Area = 1400 m², Length (l) = Breadth (b) + 22.

Formula Used: Area = l × b

=> b × (b + 22) = 1400

=> b² + 22b − 1400 = 0

=> b² + 50b − 28b − 1400 = 0

=> b(b + 50) − 28(b + 50) = 0

=> (b − 28)(b + 50) = 0

=> b = 28 or b = −50 (Breadth cannot be negative)

Therefore The correct answer is 28 m.

Additional Information

Perimeter of Rectangle

The distance around the boundary of a rectangle is given by 2 × (Length + Breadth).

Diagonal of Rectangle

The straight line connecting opposite corners is calculated using √(Length² + Breadth²).

Quadratic Roots Property

For a quadratic equation ax² + bx + c = 0, the sum of roots is −b/a and the product is c/a.

Q53. Answer: (d) 400

Shortcut Trick

The parts are related as A/2 = B/3 = C/5 = k.

Ratio of A : B : C = 2 : 3 : 5.

Total units = 2 + 3 + 5 = 10 units.

Given total amount = Rs. 2,000.

10 units = 2,000 => 1 unit = 200.

A's part (2 units) = 2 × 200 = 400.

Therefore The correct answer is Rs. 400.

Alternate Method

Given → Total Amount = Rs. 2,000 | Condition: (1/2)A = (1/3)B = (1/5)C.

Formulas: Total = A + B + C | Ratio x : y : z => Share of x = [x ÷ (x+y+z)] × Total.

=> Let (1/2)A = (1/3)B = (1/5)C = k.

=> A = 2k, B = 3k, C = 5k.

=> 2k + 3k + 5k = 2,000.

=> 10k = 2,000 => k = 200.

=> A's part = 2 × 200 = 400.

Therefore The correct answer is Rs. 400.

Additional Information

Ratio and Proportion

If aA = bB = cC, then the ratio A : B : C is 1/a : 1/b : 1/c.

Division of Amount

To divide a sum S in ratio a:b:c, the parts are [a/(a+b+c)]S, [b/(a+b+c)]S, and [c/(a+b+c)]S.

Q54. Answer: (a) Fe(s)

The correct answer is Fe(s).

Key Points:

• The given reaction is:

• 4Fe(s) + 3O2(g) → 2Fe2O3(s).

• Oxidizing agents are substances that have the ability to add oxygen, a non-metallic chemical, and remove hydrogen, or a metallic element.

• Iron oxide is created when iron and air interact (rust).

• Iron is oxidized in this reaction by the addition of oxygen.

• Here, the oxidizing agent is oxygen.

Additional Information:

• Oxidation-reduction

• An oxidation-reduction (redox) reaction is a chemical process in which two compounds exchange electrons.

• Any chemical reaction in which the oxidation number of a molecule, atom or ion changes by acquiring or losing an electron is referred to as an oxidation-reduction reaction.

• Many fundamental processes of life, such as photosynthesis, respiration, combustion, and corrosion or rusting, depend on redox reactions.

• Energy changes in form of heat, light, electricity, etc. accompany these reactions.

• The addition of oxygen or hydrogen to various compounds is another step in the oxidation and reduction reactions.

Q55. Answer: (b) IIT-Bombay

The Correct Answer is IIT-Bombay.

Key Points

• "NanoSniffer" was introduced on April 9, 2021, by Union Education Minister Ramesh Pokhriyal, or "Nishank."

• India used a NanoSniffer micro-electromechanical system (MEMS) to create the first micro-sensor-based explosive trace detector (ETD) in the world.

• The IIT Bombay startup NanoSniff Technologies created Nanosniffer, while Vehant Technologies, a spin-off of the IIT Delhi startup Kritikal Solutions, is responsible for marketing it.

• It accurately identifies a variety of military, commercial, and homemade explosives threats and offers visible and auditory alerts with a sunlight-readable colour display. NanoSniffer offers trace detection of the nano-gram level of explosives in less than 10 seconds.

Additional Information

• NanoSniffer

• High Energy Materials Research Laboratory (HEMRL) testing conducted by the DRDO in Pune found Nanosniffer to be successful.

• The nation's top counterterrorism unit, the National Security Guard, has also tested Nanosniffer (NSG).

• The development of NanoSniffer is a step towards Atmanirbhar Bharat, Prime Minister Narendra Modi's goal for an independent India.

Q56. Answer: (d) 27

Given:

[(12 ÷ 4) ×{12/3+5/3 ×(7-4)}]

Concept used:

BODMAS

Preference will be given on the basis of the letter coming first in the word Bodmas.

Calculation:

[(12 ÷ 4) ×{12/3+5/3 ×(7-4)}]

= [(12 ÷ 4) ×{12/3+5/3 ×(3)}]

= [(12 ÷ 4) ×{4+5}]

= [(12 ÷ 4) × 9]

= 3 × 9

= 27

Thus, the required value is 27.

Hence, the correct answer is option 4.

Q57. Answer: (b) 6

Given number: 2079816

After arranging numbers in increasing order from left to right it becomes,

0126789

And the middle digit will be 6.

Hence, "Option 2" is the correct answer.

Q58. Answer: (c) 2/3

Given:

(0.068 × 3.5 × 12)/(3.6 × 0.17 × 7)

Calculation:

(0.068 × 3.5 × 12)/(3.6 × 0.17 × 7)

= (68 × 3.5 × 12)/(36 × 17 × 7)

= 2856/4284

= 2/3

Hence, the required value is 2/3

Q59. Answer: (c) East

According to the given information directions are represented as,

Mohit is in the East direction with respect to Kamal.

Hence, "Option 3" is the correct answer.

Q60. Answer: (a) PIO - KRT - FIY

According to english alphabet series

The pattern followed here is :

ULJ - POO - KLT

and,

LMF - GNK - BMP

Similarly,

PIO - KRT - FIY

Hence, "Option 1" is the correct answer.

Q61. Answer: (a) Rs. 96

Shortcut Trick

Ratio of Cost Price (CP) to Marked Price (MP) is given by (100 − D%) : (100 + P%).

CP : MP = (100 − 20) : (100 + 25) = 80 : 125.

Simplifying the ratio: 16 : 25.

According to the question, 25 units = Rs. 150.

1 unit = 150 ÷ 25 = Rs. 6.

16 units = 16 × 6 = Rs. 96.

Therefore The correct answer is Rs. 96.

Alternate Method

Given: Marked Price (MP) = Rs. 150, Discount = 20%, Profit = 25%.

Formulas: Selling Price (SP) = MP × (100 − D%) ÷ 100 | Cost Price (CP) = SP × 100 ÷ (100 + P%).

=> SP = 150 × (100 − 20) ÷ 100 = 150 × 0.8 = Rs. 120.

=> CP = 120 × 100 ÷ (100 + 25) = 120 × 100 ÷ 125.

=> CP = 120 × 4 ÷ 5 = 24 × 4 = Rs. 96.

Therefore The correct answer is Rs. 96.

Additional Information

Relationship between CP and MP

The direct formula CP/MP = (100 − Discount%) / (100 + Profit%) is derived by equating the two expressions for Selling Price (SP).

Marked Price and Discount

Discount is always calculated on the Marked Price (MP), while Profit or Loss is calculated on the Cost Price (CP).

Q62. Answer: (a) less deep than it actually is

The correct answer is less deep than it actually is.

Key Points:

• When viewed directly above, swimming pools appear shallower than they actually are due to light reflection at the water's surface.

• The reason for this is that the light rays emanating from the submerged item do not strike us directly.

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• As long as the light is in the water, it goes straight; however, if the light exits the water obliquely into the air, it is bent downward toward the surface.

• Refraction is the term for this bending, which happens whenever light travels through one transparent medium and then into another that has a different density.

• Our eyes do not account for refraction; instead, they determine the object's position as though the light had come from a straight line.

• Light accelerates once again as it leaves a liquid or piece of glass and enters the air.

• It will refract away from the normal if it encounters the glass-air interface at any angle other than 0°.

• This is accurate for small angles, however as the angles increase, something else occurs.

• Because of this, swimming pools seem to get shallower as you approach the end that is farthest from you.

Additional Information:

• Refraction in physics is the redirection of a wave as it travels through one medium and then another.

• A change in the medium or a change in the wave's speed might both result in a redirection.

• Although refraction of light waves is the most frequently seen phenomenon, refraction can also occur with sound waves and water waves.

• The wave speed change and the initial wave propagation direction in relation to the wave speed change both affect how much a wave is refracted.

Q63. Answer: (b) Rs. 5,750

Shortcut Trick

Total Salary = 100%

Rent = 20% | Remaining = 100% − 20% = 80%

Sum of non-rent values = 600 (Conveyance) + 3500 (Grocery) + 500 (Savings) = Rs. 4,600

80% of Salary = 4,600

100% of Salary = (4,600 ÷ 80) × 100 = 57.5 × 100 = Rs. 5,750

Therefore The correct answer is Rs. 5,750.

Alternate Method

Given:

House Rent = 20% of Salary

Conveyance = Rs. 600

Grocery = Rs. 3,500

Savings = Rs. 500

Formula Used:

Total Salary = Rent + Conveyance + Grocery + Savings

Monthly Salary Distribution (100%)

Rent

20%

Conveyance + Grocery + Savings

80% = Rs. 4,600

Total Salary (x) = ?

Calculations:

=> Let the total monthly salary be x.

=> Expenditure on Rent = 20% of x = 0.20x

=> Sum of Conveyance, Grocery, and Savings = 600 + 3,500 + 500 = Rs. 4,600

=> Total Salary − Rent = Conveyance + Grocery + Savings

=> x − 0.20x = 4,600

=> 0.80x = 4,600

=> x = 4,600 ÷ 0.80

=> x = 46,000 ÷ 8

=> x = 5,750

Therefore The correct answer is Rs. 5,750.

Additional Information

Basic Income-Expenditure Relation

Income = Total Expenditure + Savings. This is the fundamental equation for all salary-based problems.

Percentage Expenditure

If p% is spent on one item, then the remaining percentage is (100 − p)%. The absolute value of the remaining amount can be equated to this remaining percentage.

Successive Percentage Method

If a man spends x% of salary and then y% of the remaining salary, the final savings = Total × (100 − x)/100 × (100 − y)/100.

Q64. Answer: (d) the rituals of the Yagna

The correct answer is The rituals of the Yagna.

Key Points

• The Yajur Veda contains the rituals of the Yagna.

• The Yajur Veda is an ancient collection of Sanskrit verses and mantras, used in Hindu rituals and worship.

• It is one of the four primary scriptures of Hinduism known as the Vedas - Rig Veda, Yajur Veda, Atharva Veda and Sama Veda.

• The name is derived from the Sanskrit roots - yajus, meaning "sacrifice" or "worship" and veda, meaning "knowledge", Yajur Veda can be translated as "Knowledge of the Sacrifice".

• The Yajur Veda is divided into two parts - the "pure" or white Yajur Veda known as Shukla, and the "dark" or black Yajur Veda known as Krishna. The Shukla deals with prayers and specific instructions for devotional sacrifices, whereas the Krishna deals with sacrificial rituals.

Additional Information

• The Sama Veda deals with melodies.

• It is a collection of melodies and chants, and is also called the "Book of Song", "Veda of Chants" or "Yoga of Song."

• It should not be read or recited, but sung.

• The Atharva Veda contains magic spells.

• It is a collection of 20 books containing chants, hymns, spells and prayers; and involves issues such as healing of illnesses, black magic, prolonging life, and rituals for removing maladies and anxieties.

• The Rig Veda is the Veda of mantra.

• It is organized into 10 books, called mandalas.

• It is the oldest of the Vedas, and one of the oldest extant texts in any Indo-European language.

Q65. Answer: (b) both the roots are negative and rational

Shortcut Trick

Convert the equation to standard form: x2 + 18x + 56 = 0.

Check the Sum of roots (−b/a = −18) and Product of roots (c/a = 56).

Since the product is positive and the sum is negative, both roots must be negative.

Calculate Discriminant D = 182 − 4(56) = 100, which is a perfect square.

A perfect square discriminant implies that the roots are rational.

Therefore The correct answer is both the roots are negative and rational.

Alternate Method

Given Equation: (x + 12) (x + 6) = 42

Step 1: Expand the left side of the quadratic equation.

=> x(x + 6) + 12(x + 6) = 16

=> x2 + 6x + 12x + 72 = 16

Step 2: Bring all terms to one side to form the standard quadratic equation ax2 + bx + c = 0.

=> x2 + 18x + 72 − 16 = 0

=> x2 + 18x + 56 = 0

Step 3: Solve for x by factorization (splitting the middle term).

=> x2 + 14x + 4x + 56 = 0

=> x(x + 14) + 4(x + 14) = 0

=> (x + 14)(x + 4) = 0

Step 4: Find the roots of the equation.

=> x + 14 = 0 or x + 4 = 0

=> x = −14, −4

Conclusion: Both −14 and −4 are negative integers, and all integers are rational numbers.

Therefore The correct answer is both the roots are negative and rational.

Additional Information

Discriminant and Nature of Roots

The nature of roots is determined by D = b2 − 4ac. If D > 0 and is a perfect square, roots are real, distinct, and rational. If D > 0 and not a perfect square, roots are irrational.

Signs of Roots

For the equation ax2 + bx + c = 0, if a, b, and c have the same sign, both roots are negative. If c/a is positive and −b/a is negative, both roots are negative.

Rational Numbers

A number is rational if it can be expressed as p/q where p and q are integers and q ≠ 0. All integers (like −14 and −4) are rational because they can be written as −14/1 and −4/1.

Q66. Answer: (d) If two sides and an angle of one triangle are equal to two sides and an angle of the other triangle, then t...

Shortcut Trick

The standard congruence criteria for triangles are SSS, SAS, ASA, AAS, and RHS.

The condition SSA (Two sides and a non-included angle) is not a valid criterion for congruence.

In the SSA case, it is possible to construct two different triangles using the same measurements, known as the ambiguous case.

Unless the angle is specifically the included angle (forming the SAS rule), the triangles are not necessarily congruent.

Therefore The correct answer is If two sides and an angle of one triangle are equal to two sides and an angle of the other triangle, then the two triangles are congruent.

Alternate Method

Given: Various criteria for triangle congruence.

Properties Used: SAS (Side-Angle-Side) axiom and the Ambiguous Case of triangles.

=> For congruence, the SAS rule state that the angle must be the included angle between the two equal sides.

=> If the angle is not included (SSA), we can have a situation as shown in the diagram.

=> Consider ΔABC and ΔABD. They both share side AB (c), side BC = BD (a), and angle A (35°).

=> Even though they have two sides and one angle equal, ΔABC is clearly not congruent to ΔABD.

=> This proves that two sides and an angle (non-included) do not guarantee congruence.

Therefore The correct answer is If two sides and an angle of one triangle are equal to two sides and an angle of the other triangle, then the two triangles are congruent.

Additional Information

SAS Congruence Criterion

Two triangles are congruent if two sides and the included angle of one triangle are equal to the corresponding sides and the included angle of the other triangle.

ASA and AAS Rules

Two triangles are congruent if two angles and any side (included or non-included) are equal, as the third angle is automatically equal by the angle sum property.

RHS Congruence Criterion

For right-angled triangles, if the hypotenuse and one side of one triangle are equal to the hypotenuse and one side of another, they are congruent (this is a special case of SSA).

The SSA Ambiguous Case

SSA does not guarantee congruence because, depending on the side lengths, zero, one, or two distinct triangles can be formed with the same given parts.

Q67. Answer: (c) 2

Shortcut Trick

The volume of a sphere is proportional to the cube of its radius (V prop. to r^3).

Since the larger sphere is melted and cast into 1000 identical small spheres, the volume of each small sphere is 1 ÷ 1000 of the larger sphere.

Scale factor of radius = $\sqrt[3]{(1 \div 1000)} = 1 \div 10$

Radius of small sphere = 10 cm × (1 ÷ 10) = 1 cm

Diameter of small sphere = 2 × 1 cm = 2 cm

Therefore The correct answer is 2 cm.

Alternate Method

Given:

Radius of the larger sphere (R) = 10 cm

Number of identical small spheres (n) = 1000

The total volume of the small spheres is equal to the volume of the larger sphere.

Formula Used:

Volume of a sphere = $(4 \div 3) \times \pi \times r^3$

Calculations:

Let the radius of each small sphere be r.

Since the total volume of 1000 small spheres equals the volume of the larger sphere:

=> $1000 \times (4 \div 3) \times \pi \times r^3 = (4 \div 3) \times \pi \times R^3$

Dividing both sides by $(4 \div 3) \times \pi$:

=> $1000 \times r^3 = R^3$

Substitute the value of R = 10 cm:

=> $1000 \times r^3 = 10^3$

=> $1000 \times r^3 = 1000$

=> $r^3 = 1$

=> r = 1 cm

The diameter (d) of each of the small spheres is:

=> $d = 2 \times r$

=> $d = 2 \times 1$ cm = 2 cm

Therefore The correct answer is 2 cm.

Additional Information

Volume and Surface Area of a Sphere

For any sphere of radius r, its volume is $V = (4 \div 3) \times \pi \times r^3$ and its total surface area is $A = 4 \times \pi \times r^2$.

Volume Conservation in Recasting

When a solid object is melted and recast into another set of solid shapes, the total volume remains constant: V_(initial) = V_(final).

Scaling of Spheres Property

If a larger sphere of radius R is recast into n identical small spheres of radius r, the relation is given by r = R ÷ n^(1/3).

Q68. Answer: (a) Rs. 3,000

The correct answer is Rs. 3,000.

Key Points:

• On March 5, 2019, Prime Minister Narendra Modi unveiled the Pradhan Mantri Shram Yogi Maan-dhan pension programme.

• With the help of this massive pension plan, unorganised workers with monthly incomes of no more than Rs 15,000 are protected from financial hardship as they age.

• Any unorganised worker between the ages of 18 and 40 whose employment is temporary in nature, including home-based workers, street vendors, head loaders, brick kiln workers, cobblers, rag pickers, domestic workers, washermen, rickshaw pullers, rural landless labourers, agricultural workers, construction workers, beedi workers, handloom weavers, leather workers, etc.

• The employee should not be enrolled in any mandatory social security programmes, such as the National Pension System (NPS), the Employees' State Insurance Corporation programme, or the Employees' Provident Fund Organization programme.

• If an unorganised worker joins the programme and has made regular contributions up until the age of 60, he would receive a pension that is at least Rs. 3000 per month.

• A monthly family pension equal to 50% of the pension will be paid to the surviving spouse after his or her passing.

Additional Information:

• There is no minimum level of education required to join the Scheme.

• The subscriber just needs to pay the set contribution amount that was established at the time of joining the Scheme.

• For unorganised workers who are older than 40, there is no exception available for them to join the scheme.

• When the family pension is informed of a death and a death certificate is produced, the spouse, if still alive, will automatically be the beneficiary.

• Following the demise of the subscriber and his or her spouse, the dependents will not be eligible for pension payments.

Q69. Answer: (d) Antim Panghal

The correct answer is Antim Panghal.

Key Points:

• Antim Panghal was significantly better than her competitors in the 53 kg weight class.

• She defeated Amory Andrich of Germany, the U20 European champion, in the first round before pinning Ayaka Kimura (Japan).

• She out-technical Nataliia Klivchutska of Ukraine to win the semifinal match.

• In the crucial match, Antim defeated Alytn Shagayeva of Kazakhstan.

• After scoring two more points with one more takedown, she secured the deal.

Additional Information:

• Mulayam Yadav

• Indian socialist leader Mulayam Singh Yadav created the Samajwadi Party.

• He held the positions of Minister of Defence and Chief Minister of Uttar Pradesh for three terms each during the course of his more than a six-decade political career in India.

• Sushil Kumar

• Sushil Kumar Solanki is an Indian wrestler.

• He carried the Indian flag during the opening ceremony of the 2012 London Olympics.

• Since 1952 Olympian Khashaba Dadasaheb Jadhav's bronze medal, his 2008 Olympic medal was India's first wrestling medal.

Q70. Answer: (d) Madavi

Five friends: Sandya, Rinku, Prachi, Thiru and Madavi (all are facing north)

Sandya is to the immediate left of Rinku

Sandya is to the immediate right of Prachi.

Thiru is an immediate neighbour of both Rinku and Madavi.

Madavi is somewhere to the right of Rinku.

Madavi is sitting at the rightmost end.

Hence, "Option 4" is the correct answer.

Q71. Answer: (d) 35 Years

The correct answer is 35 Years.

Key Points:

• The position of the president was established on January 26, 1950, when India became a republic after obtaining independence on August 15, 1947, when its constitution took effect.

• The legislative assemblies of each of India's states and territories, as well as both chambers of the Indian Parliament, which were all chosen directly by the people, are used to elect the president in an indirect manner.

• Although all of the executive functions granted to the president are actually exercised by the prime minister on the advice of Cabinet Ministers, Article 53 of the Indian Constitution stipulates that the president may exercise these powers personally or through subordinate authority.

• The legal minimum age to run in the Indian presidential election is 35.

Additional Information:

• According to Article 60, the president's main responsibility is to uphold, defend, and preserve the Indian constitution and the law.

• On the chief justice's recommendation, the president selects the Chief Justice of India and other judges.

• A judge may be fired by the President with the support of two-thirds of the two Houses of the parliament.

• According to Article 76(1) of the Indian Constitution, the president of India appoints the Attorney General of India, who serves at the president's leisure as the government of India's top legal advisor.

• The president may also request the advisory opinion of the supreme court under Article 143 if they believe a legal issue or a matter of public interest has emerged.

• According to Article 88, the president may request that the attorney general attend the parliamentary proceedings and, if any, notify him of any illegal activity.

Q72. Answer: (c) Two

Six students P, Q, R, S, T, and U (All of them are facing north)

• T stands at the extreme right end of the row

• T is to the immediate right of U.

• Q stands third to the left of U.

• Q stands to the immediate left of S.
• Q stands second from one of the ends
• Q stands immediately to the right of P.
• Only two persons stand between P and R.
• R stands second to the left of the T.
• The number of persons standing to the left of T is the same as to the right of P.

Two persons stand between Q and U

Hence, "Option 3" is the correct answer.

Q73. Answer: (d) 63

Shortcut Trick

Check options for given conditions: Sum of digits = 9 and Tens digit = 2 × Units digit.

Option 1: 54 → 5+4=9, but 5 is not 2×4.

Option 2: 45 → 4+5=9, but 4 is not 2×5.

Option 3: 36 → 3+6=9, but 3 is not 2×6.

Option 4: 63 → 6+3=9 and 6 = 2 × 3. Condition satisfied.

Therefore The correct answer is 63.

Alternate Method

Given: Sum of digits = 9, Tens digit = 2 × Units digit.

Formula Used: Number = 10x + y, where x is tens digit and y is units digit.

=> Let the units digit be y.

=> The tens digit is 2y.

=> Sum of digits: 2y + y = 9

=> 3y = 9

=> y = 3

=> Tens digit (x) = 2 × 3 = 6

=> Number = 10(6) + 3 = 63

Therefore The correct answer is 63.

Additional Information

Interchanging Digits

If digits are reversed, the new number is 10y + x. The difference between original and reversed number is always 9 × (x − y).

Divisibility by 9

A number is divisible by 9 if the sum of its digits is a multiple of 9.

Place Value vs Face Value

Face value is the digit itself, while place value depends on its position (e.g., in 63, place value of 6 is 60).

Q74. Answer: (d) 220 V, 50 Hz

The correct answer is 220 V, 50 Hz.

Key Points:

• The government of India chooses the home power supply based on the environment in which we live and the supply cables that we employ.
• This configuration applies to any electrical appliance we use in our nation.
• The main voltage in India is 220V, and it alternates at a rate of 50 cycles per second.
• It is comparable to several of the nations in Europe.
• Another reason for the widespread adoption of 220V is that it has a smaller distribution footprint and costs less to distribute.
• We utilize high-resistance lines to distribute this voltage, hence the power will be quite large because power is calculated as the square of voltage times resistance.

Additional Information:

• If we compare the plug points between the USA and India, we will see that India has a 50Hz mains frequency whereas the USA has 60Hz.
• We must be aware that the frequency of the AC mains has a significant impact on a circuit's impedance.
• Therefore, the mains frequency must not change.
• All electrical goods created for the Indian market are set up to operate best at 50Hz.

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Q75. Answer: (d) 5

Given series: A C P D I U V K J Q E V F

The logic followed here is

Vowel/Consonant → Consonant → Consonant/Vowel

A C P D I U V K J Q E V F

ACP, PDI, UVK, JQE, EVF

5 consonants have one vowel on one side and one consonant on the other side as immediate neighbours.

Hence, "Option 4" is the correct answer.

Q76. Answer: (d) a waste product of these plants

The correct answer is a waste product of these plants.

Key Points

• Excretion in plants

• This process is known as excretion whenever waste and toxins leave the body.

• Animals, and other complex organisms, have developed highly specialized mechanisms for eliminating waste.

• However, unlike animals, plants don't have an elaborate excretory system. They lack specialized excretory organs. Therefore, plant excretion is relatively simple.

• Plants produce a wide variety of waste products as a result of their metabolic processes, such as cellular respiration, photosynthesis, and other reactions.

• Plants primarily excrete carbon dioxide (CO_2), excess water (H_2O) from respiration, and nitrogenous substances (N_2O) from protein metabolism.

• In addition to gaseous wastes, plants also make organic wastes as part of their metabolism. In different places, these wastes are kept in different ways. Plant parts like bark, stems, leaves, etc. store waste products like gums, oils, latex, resins, etc. Over time, plants are able to discard these components.

Additional Information

• Acacias are a diverse group of trees and shrubs with over 1,000 species.

• Acacias grow in both deserts and tropical climates.

• As a result, they have a wide range and are indigenous to Australia, South Africa, the Southwestern United States, and South and Central America.

Q77. Answer: (a) Both I and II weaken the statement

Statement:

Keeping children below the age of two in day care should be avoided as it only has disadvantages.

Arguments:

I. Since some parents have full time jobs with no one to take care of their children at home, keeping children in day care can provide the children with the required care → In this argument there is no part where disadvantages of day care is shown but the argument talks about the plus point of day care which promotes the use of day care amongst parents with full time jobs. As the argument does not support the given statement instead it showcase the advantages of day care, it clearly weakens the statement.

II. Children at day care benefit by having other children around and develop good social skills → In this argument, an advantage of day care is stated that social skills of the children benefits which is a positive point but it does not support the statement given, this argument encourages day care facilities and therefore it weakens the statement.

So both I and II weaken the statement.

Hence the correct answer is option 1).

Q78. Answer: (a) Calcium carbonate

The correct answer is Calcium carbonate.

Key Points

• Calcium carbonate

• Calcium carbonate, often known as $CaCO_3$, may be found in almost every part of the planet and accounts for more than 4% of the crust of the earth.

• Chalk, limestone, and marble are their most prevalent forms in nature.

• These three stones were formed over the course of millions of years by the sedimentation of the fossilized shells of small fossilized snails, shellfish, and coral.

• Although there is no difference between any of the three forms in terms of their chemical composition, there are other ways in which they are distinct from one another, including purity, whiteness, thickness, and homogeneity.

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Additional Information

• Calcium oxide

• Cao is the chemical formula for calcium oxide.

• Calcium and oxygen are the two primary elements that makeup calcium oxide.

• In order to make it, calcium carbonate (like limestone) is heated to temperatures between 500 and 600 degrees Celsius in a special kiln called a lime kiln, where it breaks down into oxide and carbon dioxide.

• Calcium bicarbonate

• Ca(HCO3)2 is the chemical formula for calcium bicarbonate, which is also known as calcium hydrogen carbonate.

• Calcium bicarbonate is often referred to as cleaning lime.

• Both sodium bicarbonate and this compound contain bicarbonate, which is composed of hydrogen, carbon, and oxygen atoms.

• The formation of caverns, stalagmites, and stalactites results in the production of cleansing lime, which only exists in liquid form.

• Calcium hydroxide

• Calcium hydroxide, often known as slaked lime, is represented by the chemical formula Ca(OH)_(2.)

• In its solid form, this inorganic chemical appears white and powdery.

• On the other hand, crystallized Ca(OH)2 looks completely colorless.

Q79. Answer: (c) (15, 274, 7)

Logic: (First number)² + (Third number)² = Second number

(11, 202, 9) → (11)² + (9)² => 121 + 81 = 202

and,

(13, 233, 8) → (13)2 + (8)2 => 169 + 64 = 233

Similarly,

(15, 274, 7) → (15)2 + (7)2 => 225 + 49 = 274

Hence, "Option 3" is the correct answer.

Q80. Answer: (a) WNZ30

According to english alphabet positional value

The pattern followed here is :

Hence, "Option 1" is the correct answer.

Q81. Answer: (a) Sodium carbonate and washing soda

The correct answer is Sodium carbonate and washing soda.

Key Points

• Sodium carbonate

• Baking soda, which is also called sodium bicarbonate (NaHCO3), is a chemical that can break down when heated.

• Sodium bicarbonate begins to breakdown into sodium carbonate (Na2CO3), water (H2O), and carbon dioxide (CO2) at temperatures above 176 °F (80 °C)

• The sodium bicarbonate will decompose at a quicker rate the higher the temperature that it is exposed to.

• As a solid product, nothing except sodium carbonate will be left over.

• Because carbon dioxide and water both become gaseous when exposed to heated temperatures, this indicates that they will disappear into the air around them.

• Washing soda

• The production of washing soda involves the recrystallization of sodium carbonate.

• Washing soda is a powder that is white in color and odorless.

• Sodium carbonate decahydrate is a more common name for this substance, which has the chemical formula Na2CO3.10H2O.

• It is capable of drawing moisture from the surrounding air due to its hygroscopic nature.

• It has a high solubility in water and produces a very alkaline solution when dissolved in it.

Additional Information

• Uses of Sodium carbonate

• It is used to make soaps, detergents, and paper.

• It is utilized as a wetting agent in the brick manufacturing sector.

• It is used to soften hard water, which contains magnesium and calcium. Carbonate causes ion precipitation.

• It is utilized to modify pH.

• In toothpaste, it serves as an abrasive and foaming agent.
• Uses of Sodium bicarbonate
• Baking soda (sodium bicarbonate) can help with acid indigestion, sour stomach, and heartburn by acting as an acid neutralizer.
• When used in this way, the medication is classified as an antacid.
• In some cases, it is used to reduce the discomfort associated with duodenal or stomach ulcers.
• Alkalizing the blood and urine with sodium bicarbonate is a common practice in some medical situations.
• Uses of Washing soda
• It is a reagent that is used in the laboratory.
• It is utilized in the process of eliminating stains.
• It is put to use in the process of eliminating the water's inherent hardness.
• Washing soda is used in the production of soap, paper, and glass, among other things.
• In addition to that, it has applications in the textile and petroleum refining industries.
• Uses of bleaching powder
• It is a strong oxidizer, so many industries use it as an oxidizer.
• It is used as a disinfectant to clean water so that it is safe to drink.
• It is used in the laundry to bleach dirty clothes and in the textile industry to bleach cotton and linen.

Q82. Answer: (c) At the underside of leaves

The correct answer is At the underside of leaves.

Key Points

• Ferns grow new plants from groups of spores called sori, which are usually found on the underside of the fronds.
• The spores can have a variety of colors, including yellow, green, brown, and even black.
• When the spores are ripe, the sori are sometimes covered by a membrane called an indusium, which lifts off.

Additional Information

• Ferns come from a family of plants that is more than 300 million years old.
• Ferns are best propagated via division, but they can also be cultivated from spores.
• Growing ferns is simple, and they flourish in environments with high humidity and indirect light.
• The humidity surrounding the plants is much more important than the amount of moisture present in the soil itself.
• Fertilizing ferns in the garden is not necessary, but fertilizing plants in containers once a month with a liquid fertilizer that has been diluted by half is beneficial for the plants.
• Remove the fronds as they begin to wither in order to allow space for new development and enhance the plant's look.

Q83. Answer: (d) a unique value at any point in space

The correct answer is a unique value at any point in space.

Key Points

• Why do magnetic field lines never cross each other?
• If magnetic field lines cross, there will be two directions of the same field at the point where they meet. This is not possible. So, the lines of the fields don't cross or intersect each other.

Additional Information

• What is a magnetic field?
• The force of magnetism acts on the area around a magnetic material or a moving electric charge. This area is called the magnetic field.
• A magnetic field is made up of moving electric charges and the natural magnetic moments of elementary particles, which are linked to a basic quantum property called spin.
• Magnetic field and electric field are interconnected and constituents of the electromagnetic force, one of nature's four fundamental forces.
• Magnetic field lines and their properties
• Magnetic field lines never intersect.
• The density of the field lines shows the field's strength.
• Magnetic field lines always arise from or begin at the north pole and end at the south pole.
• Always, magnetic field lines form closed loops.

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Q84. Answer: (b) #K&F$D^#

Given:

A cluster of number: 85624731

According to the given cluster, condition number 2 should be implemented.

If the first digit is even and the last digit is odd, both are to be coded by the code for the first digit.

So, 85624731 will be coded as

Number/digit	8	5	6	2	4	7	3	1	
Code	#	K	&	F	$	D	^	#	

Thus, the required code will be #K&F$D^#

Hence, "Option 2" is the correct answer.

Q85. Answer: (b) 2Mg(s) + O2(g) → 2MgO(s)

The correct answer is 2Mg(s) + O2(g) → 2MgO(s).

Key Points

• The reaction between magnesium metal and oxygen produces magnesium oxide.

• This chemical reaction occurs when magnesium metal is burnt in the air.

• When magnesium and oxygen are combined, the resulting compound is called magnesium oxide and has the appearance of a white powder.

• In this reaction, two or more reactants combine to generate a single product, making it an example of a combination reaction, also called a synthesis reaction.

Additional Information

• Here,2 magnesium atoms react with an oxygen molecule to create 2 molecules of magnesium oxide while also releasing some heat.

• Magnesium and oxygen are divalent elements which means elements with 2 valencies are known as divalent.

• What is known as a valency of an element?

• Valency is the ability of an element to combine with other elements.

• One atom of Chlorine (Cl) combines with one atom of Hydrogen (H) to form a molecule of hydrogen chloride.

Q86. Answer: (d) 15120

Shortcut Trick

Common middle number = HCF of 432 and 945.

HCF(432, 945) => 945 − (2 × 432) = 81; Check factors of 81 → 27 divides both.

Middle number = 27. First = 432 ÷ 27 = 16. Third = 945 ÷ 27 = 35.

LCM of co-prime numbers = Product of numbers = 16 × 27 × 35 = 15120.

Therefore The correct answer is 15120.

Alternate Method

Let the three co-prime numbers be x, y, and z.

Given: xy = 432 and yz = 945.

Since x, y, z are co-prime, the common factor y must be the HCF of 432 and 945.

=> y = HCF(432, 945)

=> 432 = 2^4 × 3^3 = 16 × 27

=> 945 = 3^3 × 5 × 7 = 27 × 35

=> y = 27

=> x = 432 ÷ 27 = 16

=> z = 945 ÷ 27 = 35

=> LCM(16, 27, 35) = 16 × 27 × 35 (as they are co-prime)

=> LCM = 432 × 35 = 15120.

Therefore The correct answer is 15120.

Additional Information

Co-prime Numbers

Two or more numbers are said to be co-prime if their Highest Common Factor (HCF) is 1. Example: (8, 9, 25).

LCM of Co-prime Numbers

The Least Common Multiple (LCM) of a set of co-prime numbers is always equal to their product.

Relation between HCF and Product

If xy = A and yz = B, where x, y, z are co-prime, then y = HCF(A, B).

Q87. Answer: (d) 2

Circle = Sports persons

Square = Coaches

Triangle = Administrators

Total no. of sports persons who are coaches and administrators are 4

But the highlighted portion shows sports persons who are coaches but NOT administrators are 2

Hence, "Option 4" is the correct answer.

Q88. Answer: (b) Both conclusions I and II are true

Given statement: E = A < T ≤ D > H > O < X

I. D > E → True (as E = A < T ≤ D so possible)

II. D > O → True (as D > H > O so possible)

Both conclusions I and II are true.

Hence, "Option 2" is the correct answer.

Q89. Answer: (d) Hydrogen was assigned a fixed position in the Mendeleev's periodic table.

The correct answer is Hydrogen was assigned a fixed position in the Mendeleev's periodic table.

Key Points

• What is Mendeleev's periodic table?

• Dmitri Mendeleev sought to establish a connection between the atomic masses of the elements and their observed chemical and physical properties.

• The physical and chemical properties of the elements are a periodic function of their atomic masses, according to Mendeleev's Periodic Law.

• The periodic table was created by Mendeleev and lists all of the known elements in order of their atomic masses. Groups of elements sharing common properties were arranged in rows. The spaces in between the vertical columns were called periods.

Additional Information

• Difference between Modern Periodic Table and Mendeleev's Periodic Table:

• The periodic chart of Mendeleev is based on atomic mass whereas the atomic number is the foundation for the modern periodic table.

• About 63 elements can be found on Mendeleev's periodic chart and roughly 118 elements can be found on the modern periodic table.

• Noble gases were not listed in Mendeleev's periodic table (since they were not found at that time), but in the modern periodic table, noble gases are located in a separate group that is designated as group 18.

• Mendeleev's periodic table contained gaps for undiscovered elements, whereas the present periodic table is uniform.

• In Mendeleev's periodic table, transition elements are grouped with other elements, however, in the modern periodic table, they are arranged in separate blocks.

Q90. Answer: (a) 50,000

The correct answer is 50,000.

Key Points:

• India has reached the landmark of 50,000 ODF Plus (open defecation-free) communities.

• Telangana, with 13,960 ODF Plus villages, is one of the best-performing States, followed by Tamil Nadu and Madhya Pradesh.

• To ensure that all villages in the nation may proclaim themselves ODF Plus by the end of 2024, Swachh Bharat Mission Grameen Phase-II was introduced in February 2020.

• The Gobardhan Scheme, the management of biodegradable waste, the management of grey water, the management of plastic waste, and the management of feces sludge were all parts of the aim to become ODF Plus.

• To highlight their development, the ODF Plus communities were split into three categories: Aspiring, Rising, and Model.

Additional Information:

• The Swachh Bharat Mission was established by the Indian Prime Minister on October 2, 2014, in order to speed up efforts to attain universal sanitation coverage and to place sanitation front and center.

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• By building nearly 100 million toilets in rural India, the project aimed to have all villages, Gram Panchayats, Districts, States, and Union Territories declare themselves "open-defecation free" (ODF) by 2 October 2019, the 150th anniversary of Mahatma Gandhi's birth.

• The Mission is advanced towards the next Phase II of SBMG, i.e. ODF-Plus, to ensure that open defecation-free behaviors are maintained, no one is left behind, and that solid and liquid waste management facilities are accessible.

• Activities for ODF Plus under Phase II of the Swachh Bharat Mission (Grameen) emphasized interventions for the secure management of solid and liquid waste in communities while reinforcing ODF behaviors.

Q91. Answer: (c) Who is a parent or guardian, to provide opportunities for education to his child or, as the case may be, wa...

The correct answer is Who is a parent or guardian, to provide op22portunities for education to his child or, as the case may be, ward, between the age of six and fourteen years.

Key Points:

• Ten Fundamental Duties were introduced to the Indian Constitution by the 42nd Amendment Act of 1976.

• Later, the 11th Fundamental Duty was added to the list by the 86th Amendment Act of 2002.

• Fundamental Duties, which were felt to be necessary during the internal crises of 1975–1977, were recommended by the Swaran Singh Committee in 1976.

• Under Part-IV A of the Indian Constitution, Article 51A addresses the Fundamental Duties.

• In addition to fostering and producing culture, basic obligations imposed by the 42nd Amendment Act of the Constitution in 1976 also give the legislature more power to uphold these obligations in relation to basic rights.

• To his ward or child between the ages of six and fourteen, provide educational possibilities.

• This 86th Constitutional Amendment Act of 2002 added this duty.

Additional Information:

• Importance of Fundamental Duties:

• They serve as a reminder to Indian citizens of their obligations to society, their fellow citizens, and the country.

• They caution people to avoid engaging in anti-social and anti-national behavior.

• They motivate others and instill a sense of devotion and discipline in them.

• They assist the courts in reviewing and determining whether a statute is constitutional.

Q92. Answer: (c) Silicon and germanium

The correct answer is Silicon and germanium.

Key Points

• The chemical elements known as semimetals or metalloids are those that share characteristics with both metals and nonmetals.

• Important semiconductors and metalloids are frequently utilized in computers and other electrical devices.

• Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, Polonium, and Tennessine are examples of semimetals.

• Metalloids are often solids that have a shiny appearance and are brittle. They function as insulators while they are at room temperature, but transform into conductors when they are heated or mixed with other elements.

• On the periodic table, metalloids are arranged in a zigzag pattern between boron and aluminum and continue down to polonium and astatine.

Additional Information

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Q93. Answer: (a) Bhopal

The correct answer is Bhopal.

Key Points:

• In a 5-2 game final played in Bhopal, Madhya Pradesh, Pankaj Advani defeated his PSPB teammate Dhruv Sitwala to win his 11th competition and successfully defend his National Billiards Title.

• He competed in the National Billiards Championship on behalf of the Petroleum Sports Promotion Board (PSPB) team.

• The 88th National Billiards Championship 2021 was held at SAGE University and was sponsored by the Billiards and Snooker Federation of India (BSFI), which is the national regulatory organization for cue sports in India.

• This national sporting occasion is presented by SAGE University in cooperation with the MP Billiard & Snooker Association and the Sports and Youth Welfare Department.

• Given the significance of sports as a pillar crucial to the development of aspirants' careers, there is an infrastructure specifically created for sports.

Additional Information:

• The premier international amateur English billiards event is the IBSF World Billiards Championship, formerly known as the World Amateur Billiards Championship.

• Since 1973, the International Billiards and Snooker Federation have recognized the event, which has been taking place at least since 1951.

• Before the first "world amateur" championship was held in 1951 under the supervision of the Billiards Association and Control Council, this sport was once known as the Empire Billiards Championship (located in London).

• After much consideration, the World Billiards and Snooker Council were founded in 1971.

• In 1973, it changed its name to the International Billiards & Snooker Federation.

Q94. Answer: (a) 8 days

Shortcut Trick

Total work = LCM(10, 15) = 30 units.

Efficiency of A = 30 ÷ 10 = 3 units/day; Efficiency of B = 30 ÷ 15 = 2 units/day.

Work done by A and B in 3 days = 3 × (3 + 2) = 15 units.

Remaining work = 30 − 15 = 15 units; Time taken by A to finish = 15 ÷ 3 = 5 days.

Total time = 3 days (together) + 5 days (A alone) = 8 days.

Therefore The correct answer is 8 days.

Alternate Method

Given: Time taken by A = 10 days, Time taken by B = 15 days.

Person	Days	Total Work	Efficiency
A	10	30	3
B	15	2	

=> Combined Efficiency of (A + B) = 3 + 2 = 5 units/day.

=> Work completed in first 3 days = 5 × 3 = 15 units.

=> Remaining Work = 30 − 15 = 15 units.

=> Time taken by A to complete remaining work = 15 ÷ 3 = 5 days.

=> Total days for the entire work = 3 + 5 = 8 days.

Therefore The correct answer is 8 days.

Additional Information

Pipes & Cisterns

Similar logic applies where efficiency of an inlet pipe is positive and an outlet pipe is negative.

Work & Wages

Wages are always distributed in the ratio of the total work done by each individual (Efficiency × Time).

Alternate Day Work

If workers work on alternate days, calculate the work done in one full cycle (e.g., 2 days) and then divide the total work.

Q95. Answer: (c) Rs. 2,000

Shortcut Trick

Let the total monthly salary be 100%.

Debt repayment = 15% → Remaining = 85%.

Expenditure = 75% of remaining → Savings = 25% of remaining.

Savings = 25% × 85% = 21.25% → 21.25% = Rs. 425.

100% = (425 ÷ 21.25) × 100 = 20 × 100 = Rs. 2,000.

Therefore The correct answer is Rs. 2,000.

Alternate Method

Given:

Debt repayment = 15% of salary

Expenditure = 75% of remaining salary

Savings = Rs. 425

Calculations:

=> Let monthly salary = S

=> Remaining salary = S − (15% of S) = 85% of S = 0.85S

=> Savings = 25% of Remaining salary (since he spends 75%)

=> 425 = 0.25 × 0.85S

=> 425 = 0.2125S

=> S = 425 ÷ 0.2125

=> S = 4250000 ÷ 2125 = 2,000

Therefore The correct answer is Rs. 2,000.

Additional Information

Percentage Change

To find the percentage of a value after successive changes, use the multiplying factor: Final = Initial × (1 − r1/100) × (1 − r2/100).

Successive Percentage Shortcut

Effective change for two successive percentages a% and b% is given by [a + b + (ab/100)]%.

Base Value Concept

Always identify the base for the percentage; here 15% is on total salary while 75% is on the remaining amount.

Q96. Answer: (a) 12 cm

The correct answer is option 1)12cm

Given:

of a lens whose power is +5.0 D.

Formula:

Power of lens:

len formula:

Calculations:

P=1/f

f=1/P=1/5=0.2m=20cm

1/f=1/v-1/u

1/20=1/v-1/(-10)

1/v=1/20+1/(-10)=(1-2)/20

v=(-20)/1=-20cm

We know that, the magnification of the lens:

m=di/do=v/u

di/6=(-20)/(-10)=2

di=6*2=12cm

Therefore, the diameter of the image is 12cm.

Q97. Answer: (c) real, inverted and enlarged

The correct answer is real, inverted and enlarged.

Key Points

• Magnification of a mirror or a lens is the ratio of the size of the image formed by the mirror or the lens and the size of the object.

• If the magnification is more than 1, the image is magnified and smaller and if it is less than 1 then it is diminished and enlarged.

• If the magnification is positive the image formed is erect and virtual and if it is negative the image formed is real and inverted.

• Here the magnification is -1.38 which is less than 1 so the image is diminished and enlarged, as the value is negative the image formed is real and inverted.

• So the image formed is real, inverted and enlarged.

Q98. Answer: (b) 968 Ω

The correct answer is option 2)968 Ω

Given:

P=50W,V=220V

Formula:

$P=(V^2)/R$

Calculations:

$P=(V^2)/R$

$R=(V^2)/P$

$R=(220^2)/50$

$R=48400/50=968\Omega$

Thus, the resistance of the bulb is 968 Ω.

Q99. Answer: (a) Iodine solution

The correct answer is "Iodine solution".

Key Points

• Iodine solution can be added as a chemical test for starch to examine if it changes color from brown to blue or black. This iodine solution test allows the separation of starch from other carbohydrates.

• Example: Iodine, for instance, will cause a peeled potato to turn black.

• One of the main sources of dietary energy for people is starch, a type of carbohydrate that is frequently discovered in nature.

• Starch can be detected using a triiodide solution, which is created by combining iodine and an iodide solution (most commonly potassium iodide).

• This solution generates a strong blue-black starch-iodine combination. The triiodide solution's brown hue persists in the absence of starch.

• When triiodide anion solution is added to starch, a charge transfer complex between the molecules forms, which is the cause of the complex that results.

• It is crucial to understand that this complex formation does not take place in solutions containing only iodine or iodide.

• Therefore, an Iodine solution is used to detect the presence of starch in food*.*

Additional Information

Solution	Use
Litmus solution	Blue litmus paper turns red under acidic conditions, while red litmus paper turns blue under basic or alkaline settings. This property of litmus allows it to be used as a primary indicator of the acidity or basicity of a solution.
Phenolphthalein	As an indicator in titration tests to show the titration's endpoint, phenolphthalein is a colorless, weak acid that is frequently utilized.
Benedict's solution	This chemical solution, which is employed in clinical urine testing for diabetes, changes color with the presence of glucose and other reducing sugars. It consists of a combination of copper sulfate, sodium or potassium citrate, and sodium carbonate.

Q100. Answer: (d) Birds and mammals

The correct answer is "Birds and mammals".

Key Points

• Warm-blooded animals known as homeotherms, such as birds and mammals, maintain a constant body temperature and are therefore unaffected by environmental temperature changes.

• Example: Bats, pigeons, and rabbits are a few examples of homeothermic creatures.

• Regardless of the environment's temperature, the body temperature of mammals and birds generally remains constant.

• No matter what the outside environment is like, homeothermy regulates body temperature internally to keep it steady.

• Although not always, this internal body temperature is typically higher than the near surroundings.

• Therefore, the correct answer is: Birds and mammals

Additional Information

• The capability of an organism to maintain its body temperature within predetermined limits despite drastically varying environmental temperatures is known as thermoregulation.

• The hypothalamus, a tiny part of the brain, regulates body temperature. The neurological system, muscles, organs, and glands get messages from the hypothalamus if it determines that the body's temperature is abnormally high or low. These signals aid in warming up or cooling down.

• Fishes are poikilothermic because they cannot regulate their body temperature and have a wide range of variations in their core body temperature.

• Reptiles are said to as poikilothermic animals since they can regulate their own body temperature in response to the ambient temperature.

• Example: Turtle, Snake, and Frog.

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