MATHEMATICS

1. If one root of the equation
   $4x^2 - 2x + (\lambda - 4) = 0$ be the
   reciprocal of the other ,
   then $\lambda =$ _____.
   a)8   b) -8   c)4   d)-4

2. If the expression $px^3 + x^2 - 2x - q$ is
   divisible by $x - 1$ and $x + 1$, then the
   values of p and q are respectively .
   (a) 2,-1   (b) -2,1
   (c) -2 ,-1   (d) 2 ,1

3. If the difference in the roots of the
   equation $x^2 - px + q = 0$ is unity ,
   then which one of them is correct?

   (a)$p^2 + 4q = 1$ (b)$p^2 - 4q = 1$
   (c) $p^2 + 4q = -1$(d) $p^2 - 4q = -1$

4. If the sum of p terms of an A.P. is q
   and the sum of q terms is p , then the
   sum of p+q terms will be ___.
   a) 0   b) p -q   c) p+q   d) –(p+q)

5. The sum of first n odd natural numbers
   is _____.
   a)2n - 1   b) 2n +1
   c) n^2 d) n^2 -1

6. What is the value of $sin^2 15^0 +$
   $sin^2 20^0 + sin^2 25^0 + \cdots + sin^2 75^0$.

   (a)$5\frac{1}{2}$ (b) $6\frac{1}{2}$
   (c) $7\frac{1}{2}$ (d) $8\frac{1}{2}$

7. If the ratio of corresponding sides of
   two similar triangles is 2:3, then the
   ratio of their corresponding altitude is :
   (a) 3:2   (b) 16:81
   (c) 4:9   (d) 2:3

8. If the radii of two concentric circles are
   6cm and 10cm , then length of chord of
   the larger circle which is tangent to the
   other is:
   (a) 8cm   (b) 10cm
   (c) 12cm   (d)16 cm

9. Determine the ratio in which the line
   $2x + 3y - 30 = 0$ divides the join of
   A(3,4) and B(7,8) .

   (a) 2:3   (b)3:1

(c) 3:2   (d) 1:3

10. The sum of the squares of two
    numbers is 685 and the difference
    between the squares of the same two
    numbers is 37 . Find the numbers .
    (a)17,18   (b)18 ,19
    (c)19, 20   (d)21,21

11. Age of Gokul is twice that of Sita.
    Before 5 years age of Gokul was 3
    times that of Sita . What is the present
    age of Sita?
    (a)10 Yrs   (b) 12 Yrs
    (c)15 Yrs   (d)20 Yrs

12. One side of a triangular plot of land is 3
    times the altitude drawn to that side. If
    the cost of watering the field at Rs 96
    per hector is Rs 3600 then what is the
    length of the side and the altitude
    drawn on it?
    (a)1524m, 508m (b)1530m ,510m
    (c)1500m ,500m (d)1515m ,505m

13. A piece of wire , when bent to form the
    greatest circle, its diameter becomes
    28cm. If the same piece of wire is bent
    to form the greatest possible square ,
    what will be its area in sq.cm .
    (a)844   (b)484
    (c)488   (d)884

14. The value of :
    $tan15^0.tan25^0.tan60^0.tan65^0.tan75^0$ is
    (a)$\sqrt{3}$ (b)1   (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{3}}$

15. If 3 chairs and 1 table cost Rs800 and
    5 chairs and 3 tables cost Rs 2000 then
    the cost of 4 chairs and 1 table is
    (a)Rs 900   (b)Rs 850
    (c)Rs 800   (d)Rs1000

16. If $a^x = b, b^y = c$ and $c^z = a$, then
    the value of $x^2 y^2 z^2$ is ...
    (a) $a^2 b^2 c^2$ (b) 1
    (c) 4   (d) $\frac{1}{a^2 b^2 c^2}$

17. If the roots of the equation $\alpha x^2 +$
    $\beta x + \gamma = 0$ are 1 and 2 , then one of
    the roots of the equation $\beta x^2 + \alpha x +$
    $\gamma = 0$ is
    (a)1   (b)0   (c)-2   (d)2

18. If the radius of a cylinder is decreased by 50% and height increased by 50% to form a new cylinder , then the volume will be decreased by :
(a)50% (b)55%
(c)62.5% (d)63%

19. If the volume and surface area of a sphere are numerically the same , then its radius is:
(a)4 (b)3 (c)2 (d)1

20. If the line segment joining (2,3) and (-1,2) is divided internally in the ratio 3:4 by the line x+2y=k, then the value of 'k' is
(a)$\frac{41}{7}$ (b)$\frac{36}{7}$ (c)$\frac{31}{7}$ (d)$\frac{5}{7}$

21. If the points $(1,1)$,(-1,-1) and $(-\sqrt{3} , k)$ are the vertices of an equilateral triangle then the value of 'k' is
(a)1 (b)$\sqrt{3}$
(c) -1 (d)$-\sqrt{2}$

22. What is the solution of
$3.5^{2x-1} - 2.5^{x-1} = 0.2$?
(a) x=5 (b)x=1
(c)x=-1 (d) x=0

23. If $a + b = 3, ab = 2$ and $a > b$, then what is the value of $2^{a^3 - b^3}$?
(a)32 (b) 64
(c)128 (d)256

24. If $f(x) = \cos x + \sin x$, then what is the maximum value of f(x) ?
(a)1 (b)$\sqrt{2}$
(c)$\sqrt{3}$ (d)2

25. The ratio of the height of a pillar and its shadow cast on the ground during a day is 1: $\sqrt{3}$. What is the elevation of the sun at that time?
(a)15^0 (b)30^0
(c) 45^0 (d)60^0

26. If A(-1,1) and B(3,-1) are the end points of one side AB of square ABCD ,then how many units will be the length of one of its diagonals?
(a)10 (b) $\sqrt{10}$
(c) 40 (d) $\sqrt{40}$

27. If the product of five consecutive integers is equal to one of them , then which greatest possible integer is likely to be contained in them?
(a)1 (b)4
(c)6 (d)10

28. How many integers occur between 10 and 200 which are divisible by 7 .
(a) 27 (b)25 (c)23 (d)21

29. What should be subtracted from each one of 21 ,38,55 and 106 so that the results of subtraction will be proportional ?
(a)4 (b)$4\frac{1}{2}$
(c) 6 (d) $6\frac{1}{2}$

30. The arithmetic mean and mode of a data are 24 and 12 respectively ,then its median is _____.
a) 25 b) 18 c) 20 d) 22

31. Mean of a certain number of observations is $\bar{x}$. If each observations is divided by m (m≠0) and increased by n, then the mean of new observation is _____.
a) $\frac{\bar{x}}{m} + n$ b) $\frac{\bar{x}}{n} + m$
c) $\bar{x} + \frac{n}{n}$ d) $\bar{x} + \frac{n}{n}$

32. $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)$ in equal to
a) 0 b) 1
c) -1 d) None of these

33. If $a\cos\theta - b\sin\theta = c$, then $a\sin\theta + b\cos\theta = $ _____.
a) $\pm\sqrt{a^2 + b^2 + c^2}$
b) $\pm\sqrt{a^2 + b^2 - c^2}$
c) $\pm\sqrt{c^2 - a^2 - b^2}$
d) None of these.

34. Two poles are 'a' metres apart and the height of one is double of the other .If from the middle point of the line joining their feet an observer finds the angular elevations of their tops to be complimentary, then the height of the smaller pole is_____.

a) $\sqrt{2}$ a metres   b) $\frac{a}{2\sqrt{2}}$ metres

c) $\frac{a}{\sqrt{2}}$ metres   d) 2a metres

35. In the formula $\bar{x} = a + h(\frac{1}{N}\sum f_i u_i)$, for finding the mean of grouped frequency distribution then $u_i = $_____.

a) $\frac{x_i + a}{h}$ b) $h(x_i - a)$

c) $\frac{x_i - a}{h}$ d) $\frac{a - x_i}{h}$

36. If 3 coins are tossed simultaneously, then the probability of getting at least two heads is _____.

a) $\frac{1}{4}$ b) $\frac{3}{8}$ c) $\frac{1}{2}$ d) $\frac{3}{4}$

37. A number is selected from first 50 natural numbers. The probability that it is a multiple of 3 or 5 is _____.

a) $\frac{13}{25}$ b) $\frac{21}{50}$ c) $\frac{12}{25}$ d) $\frac{23}{50}$

38. A number 'x' is chosen at random from the numbers -3, -2, -1, 0, 1, 2, 3. The probability that $|x| < 2$ is _____.

a) $\frac{5}{7}$ b) $\frac{2}{7}$ c) $\frac{3}{7}$ d) $\frac{1}{7}$

39. If $am \neq bl$, then the system of equations $ax + by = c$ and $lx + my = n$

a) has a unique solution

b) has no solution

c) has infinitely many solution

d) may or may not have a solution

40. If x = a, y = b is the solution of the systems of equations x - y = 2 and x + y = 4, then the values of a and b are respectively _____.

a) 3 & 1   b) 3 & 5

c) 5 & 3   d) -1 & -3

GENERAL SCIENCE

41. Commercial electric motors do not use

(a) an electromagnet to rotate the armature

(b) effectively large number of turns of conducting wire in the current carrying coil

(c) a permanent magnet to rotate the armature

(d) a soft iron core on which the coil is wound

42. A positively charged particle projected towards west is deflected towards north by a magnetic field then the direction of magnetic field is:

(a) Towards South

(b) Torwards East

(c) Downward

(d) Upward

43. Phenomenon of electromagnetic induction is:

(a) Process of charging a body

(b) Process of generating magnetic field due to a current passing through a coil

(c) Producing induced current in a coil due to relative motion between a magnet and the coil

(d) Process of rotating a coil of an electric motor

44. A ray of light travels from rarer to a dense medium. Which of the quantities does not change?

(a) Speed   (b) Wavelength

(c) Frequency   (d) Amplitude

45. When 10^{19} electrons are removed from a neutral metal plate the electric charge on it is

(a) -1.6 C   (b) +1.6C

(c) 10^{+19} C   (d) 10^{-19} C

46. The amount of charge flowing in 2 min in a wire of resistance $10\,\Omega$ when a potential difference of 20 V is applied between its ends is

(a) 120 C   (b) 240C

(c) 20 C   (d) 4 C

47. The laws of reflection hold good for

(a) plane mirror only

(b) concave mirror only

(c) convex mirror only

(d) all mirrors irrespective of their shape

48. A child is standing in front of a magic mirror. She finds the image of her head bigger, the middle portion of her body of the same size and that of the

legs smaller. The following is the order of combinations for the magic mirror from the top.
(a) Plane, convex and concave
(b) Convex, concave and plane
(c) Concave, plane and convex
(d) Convex, plane and concave

49. An object is placed 40cm from a concave mirror of focal length 20cm. The image formed is
(a) real, inverted and same in size
(b) real, inverted and smaller in size
(c) Virtual, erect and larger in size
(d) virtual, erect and smaller in size

50. The absolute refractive index of a medium is 1.5 .Then what would be the velocity of light in this medium ?
(a) 2×10^8 m/s (b) 1.5×10^8 m/s
(c) 3.5×10^8 m/s (d) 2.5×10^8 m/s

51. Two lenses of power +4 and -6 dioptres are placed in contact with each other . The focal length of the combination will be :
(a) 0.5 meter   (b) -0.1 meter
(c) -0.5 meter   (d) 0.1 meter

52. Two electric bulbs with ratings (100 W ,250V) and (50 W, 250V) are connected in series across a 250 V source .Calculate the output power ,
(a) 150 W   (b) 33.33 W
(c) 50 W   (d) 250 W

53. A long straight wire carries 5A current . Find the magnetic field induction produced at a radial distance of 5 cm from its axis .($\mu_0 = 4\pi \times 10^{-7}$ N/A^2)
(a) 0.1×10^{-4} Tesla
(b) 0.3×10^{-5} Tesla
(c) 0.2×10^{-4} Tesla
(d) 0.5×10^{-4} Tesla

54. In the electrolysis of molten $PbCl_2$
(a)Pb is deposited at cathode and oxygen gas liberated at anode
(b)Hydrogen is liberated at cathode and oxygen gas liberated at anode.
(c)Pb is deposited at cathode and chlorine gas liberated at anode
(d)Pb is deposited at cathode and hydrogen gas liberated at anode

55. Choose the correct option :
(a)$CuSO_4$ solution can be stored in a Zn container.
(b)$AgNO_3$ solution can be stored in a Cu container.
(c)$CuSO_4$ solution can be stored in a Fe container.
(d)$ZnSO_4$ solution can be stored in a Cu container.

56. Which one of the following will turn red litmus blue
a) Vinegar
b) Baking soda solution
c) Lemon juice
d) soft drinks

57. Oxidation number of F in OF_2 is
(a)-2   (b)+2
(c)-1   (d)+1

58. The alloy containing a non –metal is:

a)Brass   b)Bronze
c)Steel   d)White metal

59. Which of the following is an acid ?

a)NaOH   b)NH_4NO_3
c)Mg$(OH)_2$ d)B$(OH)_3$

60. Which one of the following is functional group of acetone ?

a)Carboxylic acid   b)Aldehyde
c)Ketone   d)Alcohol

61. Which of the following has the formula KO_2?

a)Potassium suboxide
b)Potassium peroxide
c)Potassium superoxide
d)Kalium oxide

62. In order to prepare hard water from pure water which of the following salt may be added ?
a)$CaCl_2$ b) $MgCl_2$
c)) $MgSO_4$ d) All of these

63. Among the following which one is free from unsaturation ?

a)hexane   b)hexane
c)hexyne   d)benzene

64. The adsorption of hydrogen by platinum is known as :

a)Reduction   b)Hydrogenation
c)Occlusion   d)Dehydrogenation

65. Which of the following substance sublimes on heating ?
a)Sodium Chloride
b)Washing Soda
c)Ammonium Chloride
d)Caustic Potash

66. Which of the following is used to make parachute rope ?
a)Polyester   b)Nylon
c)Rayon   d)Acrylic

67. The chief function of a gene is-

a) To determine the character of a cell.
b) To regulate cellular respiration.
c) To assist in carbon assimilation
d) To synthesize proteins.

68. A typical genotypic monohybrid ratio is—
a) 9:3:3:1   b)3:1
c)1:2:1   d)9:7

69. A triploid structure (3n) is the –
a) Zygote
b) Pollen tube
c) Megaspore
d) Endosperm

70. Photosynthesis and respiration are—
a) Complementary processes
b) Reverse processes
c) Identical processes
d) Opposite processes

71. Ecology is the study of –
a) The physical structure of organisms.
b) The inter relationships of organisms and their surroundings.
c) The inheritance of characteristics among organisms.
d) The naming and classification of organisms.

72. Which of the following organ secretes a hormone when the blood sugar rises?
a)Liver   b)Pancreas

c)salivary gland   d)gastric gland

73. Which of the following organism has 4 chamberedheart?
a)Fish   b) Frog
c)Crocodiles   d)Snakes

74. In which organism cell division is the mode of reproduction?
a)Plasmodium   b)Hydra
c)herbaceous plant   d)penicillium

75. Which method of the following is a natural mode of contraception?
a)Barrier method
b)Surgical method
c)Withdrawl method
d)hormonalmethod

76. The cross used to ascertain whether the plant is homozygous or heterozygous is—
a) linkage cross
b) reciprocal cross
c) back cross
d) monohybrid cross.

77. Seeds are called products of sexual reproduction because they—
a) Give rise to new plants.
b) Are formed by fusion of gametes.
c) Are formed by fusion of pollen tubes.
d) Can survive for longer periods.

78. The flexibility in leaves is due to a tissue called
a) chlorenchyma   b) parenchyma
c)sclerenchyma   d) collenchymas

79. Genes regulate the expression of trait by making specific
a)Protein   b)Polysaccharide
c)Lipids   d)Nucleic acids

80. Salivation is controlled by one of the following part of brain:
a)Cerebral hemisphere
b) Medulla Oblongata
c) Cerebellum
d) Pons region

MENTAL ABILITY TEST

81. Elated is to despondent as enlightened is to
a. aware   b.ignorant
c.miserable   d.tolerant

82. Reptile is to lizard as flower is to

a) petal   b) stem
c)daisy   d) alligator

83. Which word does NOT belong with the others?
a)peninsula   b)island
c)bay.   d)cape

84. In a class of 90 ,where girls are twice that of boys ,Shridar ranked fourteenth from the top ,if there are 10 girls ahead of Shridar ,how many boys are after him in rank?
a)23   b)26   c)25   d)22

85. Raji is 5 ranks ahead of Raj in a class of 46 students.If Raj's rank is twelveth from the last, what is Raji's rank from the start**?**
a)29   b)31
c)28   d)30

86. Complete analogous pair:
Influenza : Virus : : Typhoid : ?
a)Bacillus   b)Parasite
c)Protozoa   d)Bacteria

87. Complete analogous pair:
Paw : Cat : : Hoof : ?
a)Horse   b)Lion
c)Lamb   d)Elephant

88. P, Q, R, S, T, U are having different toffees. P have more toffees than only S and T both but less than Q. R has more toffees than U but less than Q. Who among them have least number of toffees?
(a) R   (b) S   (c) T   (d) Either (b) or (c)

89. Among P, Q, R, S, T and U; R is shorter than only P and U. S is shorter than T and Q. If each of them is of different heights, who among them will be the shortest?
(a) U   (b) P   (c) S   (d) R

90. Adarsh is eleventh from the left end and Naveen is 20th from the right end in a row. If they interchange their positions, Adarsh becomes fifteenth from the left end. How many persons are there in the row?
(a) 36   (b) 35   (c) 33   (d) 34

91. A is 25th from the right end and B is 25th from the left end of a row . If they interchange their position then A becomes 25th from the left end . How many persons are sitting in the row?
(a) 51   (b) 50   (c) 49   (d) CND

92. Ram is 11th to the left of Shyam, who is 15th from the left end and Harsh is 20th from the right end of a row, then what is the position of Ram from the right end of the row?
(a) 51   (b) 50   (c) 49   (d) CND

Directions (93-95): Study the following information carefully and answer the given questions.

Amongst five friends, A, B, C, D, E, each got different marks in the examination. A scored more than B but less than C. C scored 65 marks. D scored less marks than only E. The one who scored the minimum marks scored 60 marks and the one who scored the highest, scored 80 marks.

93. Who scored the second highest marks?
(a) B   b) E   (c) D   (d) C

94. Who is the most likely to have scored 62 marks?
(a) B   (b) A   (c) D   (d) E

95. Who scored the lowest marks?
(a) B   (b) E   (c) D   (d) none of these

Directions (96-100): Choose the correct alternative in the following questions:

96. Giant: Dwarf: :Genius: ?
(a) Wicked   (b) Gentle
(c) Idiot   (d) Tiny

97. Botany: Plants: : Entomology: ?
(a) Snakes   (b) Insects
(c) Birds   (d) Germs

98. Menu: Food: :Catalogue: ?
(a)Rack   (b) Newspaper
(c) Library   (d)Cotton

99. Pulp: Paper: :Hemp: ?
(a)Basket   (b) Yarn
(c) Rope   (d) Cotton

100. Mango: Fruit: : :Potato: ?
(a) Root   (b) Fruit
(c) Stem   (d) Flower

APTITUDE TEST FOR ADMISSION INTO +2 SCIENCE (2021-22)

LRDAV

ID NO. ☐☐☐☐☐☐

Time: 3 Hours

(9.30 am – 12.30 am)

SET **A**

Guidelines to the Candidates:

1. This Booklet contains printed 11 pages and 1 blank page for rough work. Any defect found should be brought to the notice of the invigilator immediately.
2. Fill in the particulars in the OMR Sheet given to you separately as per the directions given therein.
3. This test is of three hours duration.
4. There are four choices in every question as (a), (b), (c) and (d). Only one is correct. Each question carries 4 marks.
5. (i) The test consists of 100 multiple choice questions comprising Mathematics (40), Physics (13), Chemistry (13), Biology (14) and mental ability(20) carrying maximum of 400 marks.
   (ii) -1 will be awarded for each wrong answer/multiple answer.
   (iii)No mark will be awarded for any overwriting/scratching answer.
6. Each candidate must show his/her Admit Card to the invigilator whenever required.
7. No candidate shall leave his/her seat during examination.
8. Do not tear/remove any page of the Booklet.
9. Calculation, if any, may be done at the blank pages of this booklet provided at the end for rough work. No calculator is allowed.
10. After finishing the test, the booklet with the OMR sheet is to be handed over to the invigilator before leaving the room.

FASCIMILE STAMP
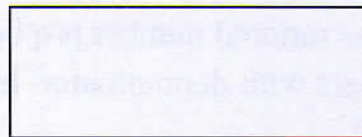
MATHEMATICS

1. A village has a circular wall around it, and the wall has four gates pointing north, south, east and west. A tree stands outside the village ,16 m north of north gate, and it can be just seen appearing on the horizon from a point 48 m east of the south gate .The diameter (in meters)of the wall that surrounds the village is
   a) 24
   b) 44
   c) 48
   d) 22

2. Suppose a,b are integers and a+b is a root of $x^2 + ax + b = 0$.The maximum possible value of b^2 is
   a) 81
   b) 111
   c) 123
   d) 41

3. In a triangle ABC ,right angled at A, the altitude through A and the internal bisector of angle A have lengths 3 and 4 respectively. The length of median through A is
   a) 22
   b) 21
   c) 41
   d) 24

4. From a square with sides of length 5, triangular pieces from the four corners are removed to form a regular octagon. The area removed to the nearest integer is
   a) 5
   b) 4
   c) 6
   d) 2

5. Let the rational number p/q be closest to but not equal to 22/7 among all rational numbers with denominator less than 100.The value of $p - 3q$ is
   a) 12
   b) 14
   c) 22
   d) 21

6. If three points (0,0) , (3 , $\sqrt{3}$) and (3,p) form an equilateral triangle , then p=
   (a) 2   (b) -4   (c) -3   (d) none of these

7. If P(2,4) , Q(0,3) , R(3,6) and S(5,y) are vertices of a parallelogram PQRS , then value of y is
   (a) 7   (b)5   (c) -7   (d) -8

8. In $\triangle ABC$, XY II BC, cuts AB at X and AC at Y. If BY bisects $\angle XYC$, then
   (a) BC=CY (b) BC=BY (c) BC$\neq$CY (d) BC$\neq$BY

9. If $\cos\theta=\frac{2}{3}$, then $2\sec^2\theta + 2\tan^2\theta -7=$
   (a) 1 (b) 0 (c) 3 (d) 4

10. $9sec^2A - 9tan^2A =$
    (a) 1 (b) 8 (c) 9 (d) 0

11. If perimeter of a semi-circular protractor is 108cm, then its diameter is
    (a) 36 cm (b) 24cm (c) 42cm (d) 48cm

12. The area of incircle of an equilateral triangle of side 42cm is
    (a) $22\sqrt{3}cm^2$ (b) $213 \ cm^2$ (c) $924 \ cm^2$ (d) $462 \ cm^2$

13. If perimeter of a circle is equal to that of a square, then ratio of their areas is
    (a) 22:7 (b) 14:11 (c) 7:22 (d) 11:14

14. Volumes of two spheres are in the ratio 64:27. The ratio of their surface areas is
    (a) 1:2 (b) 2:3 (c) 9:16 (d) 16:9

15. The probability of throwing a number greater than 2 with a fair dice is
    (a) $\frac{3}{5}$ (b) $\frac{2}{5}$ (c) $\frac{2}{3}$ (d) $\frac{1}{3}$

16. What is the probability that a leap year has 52 Mondays?
    (a) $\frac{5}{7}$ (b) $\frac{6}{7}$ (c) $\frac{2}{7}$ (d) $\frac{4}{7}$

17. If $\sin\theta+\cos\theta =\sqrt{2}$, then $\tan\theta+\cot\theta =$
    (a) 1 (b) -1 (c) -2 (d) 2

18. The point on X-axis which is equidistant from the points (-1,0) and (5,0) is
    (a) (0,2) (b) (2,0) (c) (3,0) (d) (0,3)

19. The area of a triangle formed by the line $\frac{x}{a}+\frac{y}{b} = 1$ with the coordinate axes is
    (a) ab (b) 2ab (c) $\frac{1}{2}$ab (d) $\frac{1}{4}$ab

20. If the difference of mode and median of a data is 24, then the difference of median and mean is
    (a) 12 (b) 24 (c) 8 (d) 36

21. The mean of n observations is $\bar{x}$. If the first observation is increased by 1, second by 2, the third by 3, and so on, then the new mean is
    (a) $\bar{x}+ (2n+1)$ (b) $\bar{x} + \frac{n+1}{2}$ (c) $\bar{x} + (n+1)$ (d) $\bar{x}-\frac{n+1}{2}$

22. The sum of n terms of two A P 's are in the ratio 5n+4:9n+6. Then, the ratio of their 18th term is
    (a) $\frac{179}{321}$ (b) $\frac{178}{321}$ (c) $\frac{175}{321}$ (d) $\frac{176}{321}$

23. If two tangents inclined at an angle of 60^0, are drawn to a circle of radius 3cm, then length of each tangent is equal to
    (a) $\frac{3\sqrt{3}}{2}$ cm (b) 6cm (c) 3cm (d) $3\sqrt{3}$cm

24. The perpendicular bisector of the line segment joining the points A(1,5) and B(4,6) cuts the y-axis at

    (a) (0,13)   (b) (0,-13)   (c) (0,12)   (d) (13,0)

25. If the three sides of a triangle are $a, \sqrt{3}a$ and $\sqrt{2}a$, then the measure of the angle opposite to the longest side is

    (a) 45^0 (b) 30^0 (c) 60^0 (d) 90^0

26. The value of θ for $\cos^4\theta - \sin^4\theta = \frac{1}{2}$ ($0 < \theta < 90^0$) is

    (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

27. The shadow of a tower standing on a level ground is x meters long when the sun's altitude is 30^0, while it is y metres long when the sun's altitude is 60^0. If the height of the tower is $45\frac{\sqrt{3}}{2}$ m then the value of x − y is

    (a) 45m   (b) $45\sqrt{3}$ m   (c) $\frac{45}{\sqrt{3}}$ m   (d) $45\frac{\sqrt{3}}{2}$ m

28. The ratio in which the line segment joining the points A(-12,2) and B(8,3) is divided by the y-axis is

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

29. Pair of linear equations

    $7x - 3y = 4$

    $3x + \frac{k}{7}y = 4$ is consistent only when

    (a) k= 9   (b) k= - 9   (c) k≠ −9   (d) $k \neq 7$.

30. If α, β be the zeros of the quadratic polynomial $5x + 2x^2 + 1$, then value of $\alpha + \beta + \alpha\beta$ is

    (a) −2   (b) −1   (c) 1   (d) none of these

31. The largest number which divides 70 and 125, leaving remainders 5 and 8 respectively is

    (a) 13   (b)65   (c)875   (d) 1750

32. If $\sin\theta - \cos\theta = 0$, then the value of $\sin^4\theta + \cos^4\theta$ is

    (a) 1   (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) $\frac{1}{4}$

33. The area of a circle is $220cm^2$. The area of a square inscribed in it is

    (a) $49cm^2$ (b)$70cm^2$ (c)$140cm^2$ (d) $150cm^2$

34. The area of the largest triangle that can be inscribed in a semi-circle of radius r is

    (a) 2r   (b)r^2 (c) r   (d) $\sqrt{r}$

35. A kite with sides x cm, x cm, y cm, and y cm is inscribed in a circle. The area of the kite is

    (a) xy cm^2 (b) $\frac{1}{2}$xy cm^2 (c) 2xy cm^2 (d) x^2y^2 cm^2

36. If the point (1,1) is equidistant from the points (a+b, b-a) and (a-b, a+b), then

    (a) a+b=0   (b) a+b=1   (c)a=b   (d) b-a=1

37. A train is moving in a circular curve of radius 1500m at the rate of 66km per hour. Through what angle does it turn in 10 seconds?

    (a) 10^0 (b) 15^0 (c)7^0 (d) 17^0

38. In a right triangle ABC , right angled at B, BC= 12cm and AB= 5cm. The radius of the circle inscribed in the triangle (in cm) is

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

39. A circle passes through the points A(2,-9) , B(5,-8) and C(2,1). The centre of the circle is

    (a) (2,-4)   (b) (-3,4)   (c) (3, -16/3)   (d) none of these

40. A card is drawn from a well shuffled pack of 52 cards. Find the probability that the card drawn is 5 of heart or of diamond.

    (a)1/26   (b)7/26   (c) 1/52   (d) 7/52

GENERAL SCIENCE

41. Mendel's second law is the law of
    a. Segregation
    b. Dominance
    c. Independent Assortment
    d. Polygenic inheritance

42. If haemoglobin is replaced by haemocyanin, the blood will carry
    a. Less oxygen
    b. More oxygen
    c. No oxygen
    d. Same amount of oxygen

43. The intermediate host of Trypanosoma is
    a. Sand fly
    b. Fruit fly
    c. Mosquito
    d. Tsetse fly

44. Which type of connective tissue lacks fibres?
    a. Cartilage
    b. Bone
    c. Areolar tissue
    d. Blood

45. An individual having two identical factors of a character is called
    a. Heterozygote
    b. Homozygote
    c. Hybrid
    d. None of the above

46. Which among the following sexually transmitted disease is not caused by bacteria?
    a. Syphilis
   b. Gonorrhoea
    c. Warts
    d. Chlamydia

47. Which among the following cell organelle does not contain DNA?
   a. Mitochondria
   b. Lysosome
   c. Chloroplast
   d. Nucleus
48. Which among the following has specialised tissue for conduction of water?
   a. Thallophyta
   b. Bryophyta
   c. Pteridophyta
   d. Gymnosperms

   a. (i) and (ii)   b. (ii) and (iii)   c. (iii) and (iv) d. (i) and (iv)

49. Plant trap _____ % of energy provided by the sun.
   a. 10%
   b. 2%
   c. 50%
   d. 1%
50. The number of chromosomes in both parents and offspring of a particular species remains constant because:
   a. Chromosome get doubled after zygote formation
   b. Chromosome get doubled after gamete formation
   c. Chromosome get halved during gamete formation
   d. Chromosome get halved after gamete formation
51. Respiratory organ in case of Periplanta Americana is
   a. Skin
   b. Book lungs
   c. Trachea
   d. Gills
52. The first step of photosynthesis is
   a. Ionisation of water
   b. ATP synthesis
   c. Excitation of chlorophyll by light
   d. Production of assimilatory power
53. Which among of the following is exclusively marine?
   a. Porifera
   b. Echinodermata
   c. Mollusca
   d. Pisces
54. The breakdown of pyruvate into carbon dioxide, energy and water takes place in
   a. Mitochondria
   b. Cytoplasm
   c. Endoplasmic reticulum
   d. Ribosome

55. Malachite is an ore of which metal?
   - a. Iron
   - b. Copper
   - c. Mercury
   - d. Zinc
56. Metals occur in the native state because of their:
   - a. High electro negativity
   - c. Low reactivity
   - b. Low density
   - d. All of these
57. The by-product in the manufacture of soap is:
   - a. Isoprene
   - b. Glycerol
   - c. Butene
   - d. Ethylene glycol
58. The molecular formula of second member of homologous series of ketone is:
   - a. C_4H_8O
   - b. C_3H_6O
   - c. $C_6H_{12}O_6$
   - d. $C_5H_{10}O$
59. Identify the reducing agent in the following reactions:
$$Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H_2O$$
   - a. Pb_3O_4
   - b. HCl
   - c. $PbCl_2$
   - d. Cl_2
60. Which of the following salts does not contain any water of crystallisation?
   - a. Blue vitriol
   - c. Washing soda
   - b. Baking soda
   - d. Gypsum
61. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that:
   - a. The food is not cooked completely
   - b. The fuel is not burning completely
   - c. The fuel is wet
   - d. The fuel is burning completely.
62. Identify the functional group in the following compound: $Br-CH_2- CH_2-CHO$
   - a. Aldehyde
   - c. Bromine
   - b. Alcohol
   - d. Both bromine and aldehyde.
63. Identify the wrong sequence of the elements in a group:
   - a. Ca, Sr, Ba
   - c. N, P, As
   - b. Cu, Au, Ag
   - d. Cl, Br, I
64. When a zinc strip is dipped in the blue solution of copper sulphate for some time, the colour of the solution changes to:
   - a. Pink
   - b. Green
   - c. Colourless
   - d. Remains blue
65. While preparing CO_2 in the laboratory, on which of the following substances HCl is poured?
   - a. Pieces of zinc
   - c. Crystals of copper sulphate
   - b. Pieces of marble
   - d. Ammonium chloride
66. A compound X on strong heating in a boiling tube produces reddish brown fumes and a yellow residue. Further the compound X produces a white precipitate with NaOH solution. Identify X.
   - a. Copper nitrate
   - c. Lead chloride
   - b. Lead nitrate
   - d. Zinc sulphate
67. The no. of structural isomers of the compound having molecular formula C_4H_9Br is:
   - a. 3
   - b. 5
   - c. 4
   - d. 2
68. The laws of reflection hold good for-
   - a. plane mirror only
   - b. concave mirror only
   - c. convex mirror only
   - d. all mirrors irrespective of their shape

69. A beam of light is incident through the holes on side A and emerges out of the holes on the other face of the box as shown in the Figure. Which of the following could be inside the box?

   a. Concave lens
   b. Rectangular glass slab
   c. Prism
   d. Convex lens
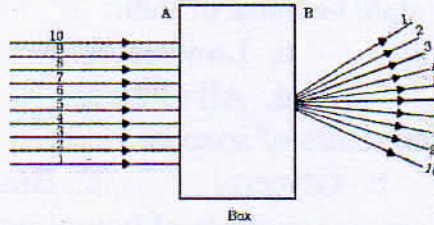
70. A child is standing in front of a magic mirror. She finds the image of her head of the same size, the middle portion of her body is bigger and that of the legs smaller. The following is the order of combinations for the magic mirror from the top.

   a. Plane, convex and concave
   b. Convex, concave and plane
   c. Concave, plane and convex
   d. Plane, concave and convex

71. In an electrical circuit three incandescent bulbs A, B and C of rating 40 W, 60 W and 100 W respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness?

   a. Brightness of all the bulbs will be the same
   b. Brightness of bulb A will be the maximum
   c. Brightness of bulb B will be more than that of A
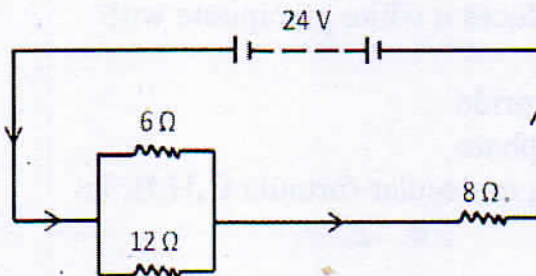   d. Brightness of bulb C will be less than that of B

72. What is the minimum resistance which can be made using five resistors each of 5 Ω?

   a. 1/5 Ω
   b. 10 Ω
   c. 5 Ω
   d. 1 Ω

73. A charge of 1.6×10^{3} C is moved between two points and 3.2 Joule of work is done. What is the potential difference between the two points?

   a. 2000V
   b. 1500V
   c. 1800V
   d. 2200V

74. The amount of current flowing through the 6Ω resistor is-

   a. 5A
   b. 1.65A
   c. 1.3A
   d. None of the above.

75. A certain length of wire carries a steady current. It is bent to form a circular coil of one turn. The same length is now bent more sharply to give a double loop of smaller radius, as shown in fig. The magnetic field at the centre caused by the same current is
   a. a quarter of its first value
   b. unaltered
   c. four times its first value
   d. one half its first value
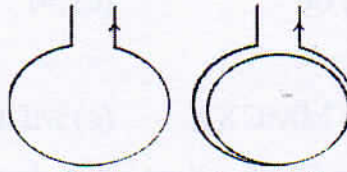
76. A uniform magnetic field exists in the plane of paper pointing from left to right as shown in Figure. In the field an electron and a proton move as shown. The electron and the proton will experience
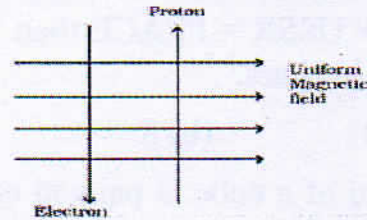
   a. forces both pointing into the plane of paper
   b. forces both pointing out of the plane of paper
   c. forces pointing into the plane of paper and out of the plane of paper, respectively
   d. force pointing opposite and along the direction of the uniform magnetic field respectively

77. A body has speed V, 2V and 3V in first 1/3 of distance S, seconds 1/3 of S and third 1/3 of S respectively. Its average speed will be

   (a) V
   (b) 2V
   (c) $\frac{18}{11} V$
   (d) $\frac{11}{18} V$

78. Which of the following is a correct relation
   (a) $_a\mu_r = _a\mu_w \times _r\mu_\omega$
   (b) $_a\mu_r \times _r\mu_w = _w\mu_a$
   (c) $_a\mu_r \times _r\mu_a = 0$
   (d) $_a\mu_r / _w\mu_r = _a\mu_w$

79. Suppose that the force of earth's gravity suddenly disappears, choose the correct answer out of the following statements
   (a) The weight of the body will become zero but mass remains the same
   (b) The mass of the body will become zero but the weight remains the same
   (c) Both the mass and weight will be doubled
   (d) Mass and weight will remain the same

80. V-i graphs for parallel and series combination of two identical resistors are as shown in figure. Which graph represents parallel combination
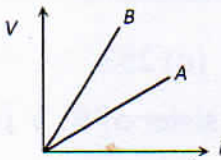
   (a) A
   (b) B
   (c) A and B both
   (d) Neither A nor B

MENTAL ABILITY TEST(MAT)

81. Find out the next number in the following series 6,20,36,48,50,__ ?

    (a) 54   (b) 60   (c) 36   (d) 38

82. Find out the odd one

    (a) MMXIV   (b) MMCXX   (c) MDCIV   (d) MLVXC

83. If 9th August 2016 was Friday, then what day it was on 9th August 1616?

    (a) Friday   (b) Thursday   (c) Sunday   (d) Tuesday

84. If USA + USSR = PEACE then P+E+A+C+E = ? All the letters represent distinct non negative integers.

    (a) 20   (b) 8   (c) 10   (d) 12

85. Each face of a cube is painted either Blue or Green. In how many different ways can the cube be painted?

    (a) 8   (b) 10   (c) 9   (d) 6

86. By making at least how many cuts can a cube be cut into 210 smaller pieces without putting the pieces one above another?

    (a) 15   (b) 18   (c) 12   (d) 13

87. If $1 \triangle 2 = 6$, $3 \triangle 2 = 12$ then $4 \triangle 5 = ?$

    (a) 20   (b) 24   (c) 25   (d) 30

88. If BED = 33; DID = 34 then DEED = ?

    (a) 18   (b) 36   (c) 54   (d) 72

89. In a row of 30 children A is 15th from the left end and B is 20th from the right end. Then how many children in between them?

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

90. Joy's house is in west direction. He moves 12m then turns right and covers 5m, then turns left and covers 12m and again turns right and covers 5m to reach at the shop. Now in which direction and how far he will go to reach at the house?

    (a) 34m, N – W   (b) 34M, West   (c) 26m, NW   (d) 26M – SE

91.

    9   18   12

    346   954   ?

12   18   10   8   30   18
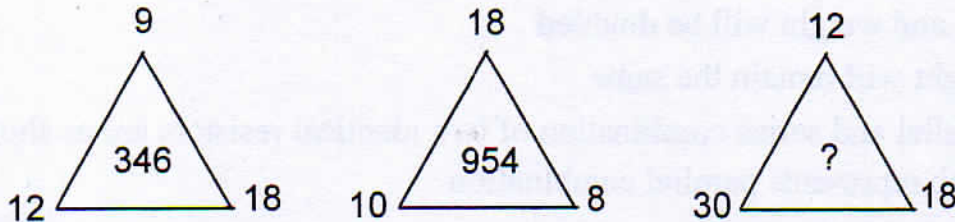
    (a) 523   (b) 325   (c) 564   (d) 253

92. T is daughter of Q. P is father of R. U is husband of Q. R is sister of S. V is father of U. Q is mother of R. How Q related to T?

    (a) Father   (b) Sister   (c) Mother-in-law   (d) Mother

93. If   24+35=28
          15+42=24
          84+57=48

Then   69+37=?

    (a) 106   (b) 62   (c) 56   (d) 50

94. If B>D; E<A, E≥ B and D≤ C then which of the following is definitely true?

    (a) A≥ B   (b) B≤ C   (c) D<A   (d) E=C

95. Find out the conclusions which logically follows from the given statements disregarding commonly known facts.

    Statements :   Some doors are books.
                         Some books are papers.
                         No chair is door.

    Conclusions :   I) some chairs are not books

                       II) some books are not chairs

                    III) some doors are papers

    (a) only I follow   (b) only II follow
    (c) both I and II follow   (d) All follow

96. 20 members of a group shake hands with one another once. How many handshakes will be there?

    (a) 40   (b) 220   (c) 200   (d) 190

97. The remainder when 7^{10} is divided by 51 is

    (a) 7   (b) 33   (c) 19   (d) 32

98. A printer number the pages of a book from 1 to 3189 digits in all. How many pages does the book have?

    (a) 1075   (b) 1074   (c) 1073   (d) 1090

99. A clock which gains uniformly was 5mt slow at 8am, Sunday and 5mt 48 sec fast at 8pm, following Sunday. When the clock shows correct time?

    (a) wed, 7:20pm   (b) wed, 6pm   (c) Thu, 7pm   (d) Thu,5pm

100. The question has a main statement followed by four statements A,B,C,D. Choose the ordered pair of statements, where the first statement implies the second and the two statements are logically consistent with main statement.
    You can not catch the fish unless it is summer.
    (A) This is summer   (B) You can catch fish
    (C) This is not summer   (D) You can't catch fish

    (a) B, D   (b) A, C   (c) C, D   (d) A, B

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Space for Rough

LRDAV

APTITUDE TEST FOR ADMISSION INTO +2 SCIENCE (2022-23)

ID NO. ☐☐☐☐☐.☐☐☐☐

SET **A**

Time: 3 Hours

(2.00 pm – 5.00 pm)

Guidelines to the Candidates:

1. This Booklet contains printed 17 pages and 1 blank page for rough work. Any defect found should be brought to the notice of the invigilator immediately.
2. Fill in the particulars in the OMR Sheet given to you separately as per the directions given therein.
3. This test is of three hours duration.
4. There are four choices in every question as (a), (b), (c) and (d). Only one is correct. Each question carries 4 marks.
5. (i) The test consists of 100 multiple choice questions comprising of Mathematics (40), Physics (14), Chemistry (14), Biology (12) and Mental Ability (20) carrying maximum of 400 marks.

   (ii) -1 will be awarded for each wrong answer/multiple answer.

   (iii) No mark will be awarded for any overwriting/scratching answer.
6. Each candidate must show his/her Admit Card to the invigilator whenever required.
7. No candidate shall leave his/her seat during examination.
8. Do not tear/remove any page of the Booklet.
9. Calculation, if any, may be done at the blank pages of this booklet provided at the end for rough work. No calculator is allowed.
10. After finishing the test, the booklet with the OMR sheet is to be handed over to the invigilator before leaving the room.

FASCIMILE STAMP
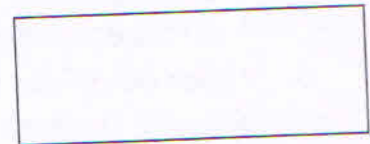
GENERAL SCIENCE

1. Match the following columns:

i.	Cytoskeleton	A. Hair-like outgrowth
ii.	Flagella	B. Proximal region of centriole
iii.	Hub	C. Bristle-like structures
iv.	Fimbriae	D. Filamentous protein structure

   a. i- C, ii – D, iii – A, iv - B
   b. i – D, ii – C, iii- B, iv – A
   c. i – D, ii – A, iii – B, iv – C
   d. i - D, ii – A, iii- C, iv – B

2. Pancreas produces
   a. Three digestive enzymes and hormone
   b. Three types of digestive enzymes and two hormones
   c. Two digestive enzymes and one hormone
   d. Three digestive enzymes and no hormone

3. Which enzymes are likely to act on the baked potatoes eaten by a man, starting from the mouth and as it moves down the alimentary canal?
   a. Pancreatic amylase →salivary amylase→ lipases → nucleases
   b. Disaccharides like maltase→ lipases → nucleases
   c. Salivary amylase→ pancreatic amylase →disaccharides
   d. Salivary maltase →carboxypeptidase→ trypsinogen

4. Which one of the following functions as a cytoplasmic framework for the cell?
   a. Golgi apparatus
   b. Endoplasmic reticulum
   c. Lysosomes
   d. Ribosomes

5. Which of the following depicts the correct pathway of transport of sperms?
   a. Rete testis→efferent ductules→epididymis →vas deferens
   b. Rete testis→ epididymis →efferent ductules →vas deferens
   c. Rete testis →vas deferens →efferent ductules → epididymis
   d. Efferent ductules →rete testis →vas deferens → epididymis

6. Which one of the following traits of garden pea studied by Mendel was a recessive feature?
   a. Axial flower position
   b. Green seed colour
   c. Green pod colour
   d. Violet flower colour

7. Syphilis is caused by _____ and transmitted by _____
   a. Virus, sexual contact
   b. Bacteria, handshakes
   c. Virus, physical contact
   d. Bacteria, sexual contact

8. A tall true breeding garden pea plant is crossed with a dwarf true breeding garden pea plant. When the F1 plants were selfed the resulting genotypes were in the ratio of:
   a. 3 : 1 : : Tall : Dwarf
   b. 3 : 1 : : Dwarf : Tall
   c. 1 : 2 : 1 : : Tall heterozygous : Tall homozygous : Dwarf
   d. 1 : 2 : 1 : : Tall homozygous : Tall heterozygous : Dwarf

9. Which of the following statements is not correct?
   a. Pollen germination and pollen tube growth are regulated by chemical components of pollen interacting with those of the pistil.
   b. Some reptiles have also been reported as pollinators in some plant species
   c. Pollen grains of many species can germinate on the stigma of the flower, but only one pollen tube of the same species grows into the style
   d. Insects that consume pollen or nectar without bringing about pollination are called pollen / nectar robbers

10. The first step for initiation of photosynthesis will be
    a. Photolysis of water
    b. Excitement of chlorophyll molecules due to absorption of light
    c. ATP formation
    d. Glucose formation

11. Which of the following is the most stable ecosystem?
    a. Mountain
    b. Ocean
    c. Forest
    d. Desert

12. If 20 J of energy is trapped at producer level, then how much energy will be available to peacock as food in the following chain?

    Plant →Mice →Snake →Peacock

    a. 0.02 J
    b. 0.002 J
    c. 0.2 J
    d. 0.0002 J

13. A satellite of the earth is revolving in a circular orbit with a uniform speed v. If the gravitational force suddenly disappears, the satellite will
    (a) Continue to move with velocity v along the original orbit
    (b) Move with a velocity v, tangentially to the original orbit
    (c) Fall down with increasing velocity
    (d) Ultimately come to rest somewhere on the original orbit

14. The value of 'g' at a particular point is $9.8\,m/s^2$. Suppose the earth suddenly shrinks uniformly to half its present size without losing any mass. The value of 'g' at the same point (assuming that the distance of the point from the centre of earth does not shrink) will now be

    (a) $4.9\,m/sec^2$ (b) $3.1\,m/sec^2$
   (c) $9.8\,m/sec^2$ (d) $19.6\,m/sec^2$

15. Two solids A and B float in water. It is observed that A floats with half its volume immersed and B floats with 2/3 of its volume immersed. Compare the densities of A and B
        (a)   4 : 3   (b)   2 : 3   (c)   3 : 4   (d)   1 : 3

16. A car travels the first half of a distance between two places at a speed of 30 km/hr and the second half of the distance at 50 km/hr. The average speed of the car for the whole journey is
    (a)   42.5 km/hr   (b)   40.0 km/hr
    (c)   37.5 km/hr   (d)   35.0 km/hr

17. A ball is thrown vertically upwards. Which of the following plots represents the speed-time graph of the ball during its height if the air resistance is not ignored

(a)

(b)

(c)

(d)
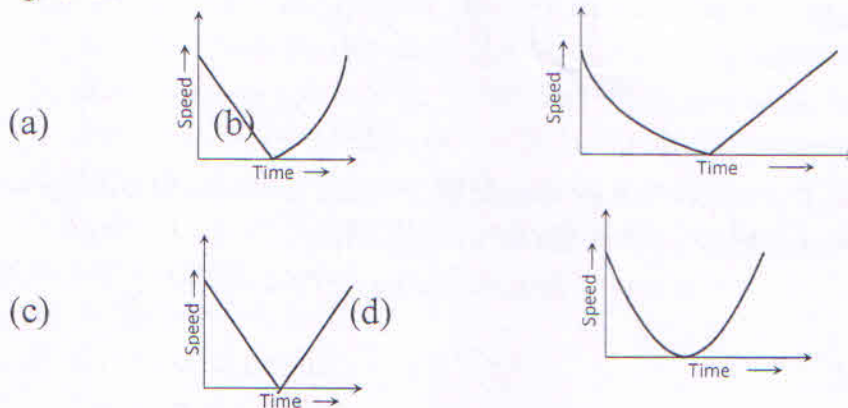
18. The resistivity of alloys $= R_{alloy}$; the resistivity of constituent metals R_{metal}. Then, usually

(a) $R_{alloy} = R_{metal}$

(b) $R_{alloy} < R_{metal}$

(c) There is no simple relation between R_{alloy} and R_{metal}

(d) $R_{alloy} > R_{metal}$

19. Masses of three wires of copper are in the ratio of $1 : 3 : 5$ and their lengths are in the ratio of $5 : 3 : 1$. The ratio of their electrical resistances are
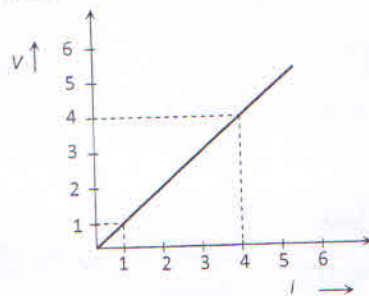
(a) $1 : 3 : 5$ (b) $5 : 3 : 1$

(c) $1 : 15 : 125$ (d) $125 : 15 : 1$

20. Variation of current and voltage in a conductor has been shown in the diagram below. The resistance of the conductor is.

(a) 4 ohm   (b) 2 ohm

(c) 3 ohm   (d) 1 ohm

21. Field at the centre of a circular coil of radius r, through which a current I flows is

(a) Directly proportional to r

(b) Inversely proportional to I

(c) Directly proportional to I

(d) Directly proportional to I^2

22. The direction of magnetic lines of forces close to a straight conductor carrying current will be

(a) Along the length of the conductor

(b) Radially outward

(c) Circular in a plane perpendicular to the conductor

(d) Helical

23. In a current carrying long solenoid, the field produced does not depend upon(a)Number of turns per unit length
(b)Current flowing
(c)Radius of the solenoid
(d)All of the above three

24. A ray of light is incident normally on a plane mirror. The angle of reflection will be

(a) $0°$ (b) $90°$

(c) Will not be reflected   (d)   None of the above

25. A cut diamond sparkles because of its
(a) Hardness
(bHigh refractive index
(c)Emission of light by the diamond
(d) Absorption of light by the diamond

26. A double convex lens, lens made of a material of refractive index μ_1, is placed inside two liquids or refractive indices μ_2 and μ_3, as shown. $\mu_2 > \mu_1 > \mu_3$. A wide, parallel beam of light is incident on the lens from the left. The lens will give rise to

(a)A single convergent beam
(b)Two different convergent beams
(c)Two different divergent beams
(d)A convergent and a divergent beam
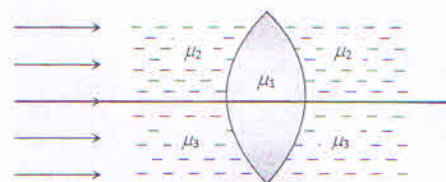
27. Which of the following is(are) exothermic process(es)?
   i.   Condensation of water vapour
  ii.   Dilution of sulphuric acid
 iii.   Sublimation of dry ice
 iv.   Evaporation of water
      a. (i) and (iii)   b. (ii) only   c. (iii) and (iv)   d. (i) and (ii)

28. Lead (II) oxide is heated with coke to produce lead and carbon dioxide. Which of the following statements are incorrect about the given reaction?
   i.   Lead is getting reduced.
  ii.   Carbon dioxide is getting oxidised.
 iii.   Carbon is getting oxidised.
 iv.   Lead oxide is getting reduced.

a. (i) and (iii)
b. (ii) and (iii)
c. (i) and (ii)
d. (iii) and iv)

29. Which of the following is not isoelectronic with O^{2-} ?
    a. N^{3-} b. Na^+ c. F^- d. Cl^-

30. The mass of a proton is:
    a. 1.008 amu   c. 1.6×10^{-24} gm
    b. 1.6×10^{-27} kg   d. All of these.

31. Substance P has the following properties:
    i.   Melts at 60^0C
    ii.   Boils at 85^0C
    iii.   Insoluble in water

Which method of separation would you use to obtain pure P from a mixture of P and water?

    a. Paper chromatography
    b. Fractional distillation
    c. Crystallisation
    d. Filtration

32. Malachite is an ore of which metal?
    a. Iron   b. Copper   c. Mercury   d. Zinc

33. The number of hydrogen atoms in 2,2-dimethyl propane is:
    a. 12   b. 10   c. 14   d. 8

34. The atomic number of the element which can form an acidic oxide is:
    a. 5   b. 16   c. 12   d. 19

35. Which of the following compounds contains an aldehydes group?
    a. C_3H_8O b. $C_3H_6O_2$ c. C_3H_6O d. C_3H_7Cl

36. Which of the following is not correctly matched?
    a. Emulsion – face cream
    b. Foam – mist
    c. Aerosol – smoke
    d. Solid sol – gem stone

37. The total number of electrons present in 32g of methane gas is:
    a. 6.022×10^{24} c. 12.044×10^{23}
    b. 1.2044×10^{25} d. 60.22×10^{23}

38. The molecular formula P_2O_5 means that:
   i.   The ratio of the mass of P to the mass of O in the molecule is 2:5.
   ii.   The ratio of the mass of P to the mass of O in the molecule is 5:2.
   iii. A molecule contains 2 atoms of P and 5 atoms of O.
   iv.   The ratio of the volume of P to the volume of O in the molecule is 2:5.
     a. (i) and (iii)   c. (iii) and (iv)
     b. (ii) and (iii)   d. (ii) and (iv)

39. Which of the following electronic configurations is wrong?
   a. $Li = 2,1$
   b. $P = 2,8,5$
   c. $S = 2,6,8$
   d. $Mg = 2,8,2$

40. Which of the following pairs of metals is extracted by means of electrolytic reduction of their molten salts?
     a. Zn and Mg   c. Mg and Mn
     b. Al and Fe   d. Al and Mg

MATHEMATICS

41. The mean of n observations is $\bar{x}$. If the first observation is increased by 1, second by 2, the third by 3, and so on, then the new mean is

   (a) $\bar{x} + (2n+1)$ (b) $\bar{x} + \frac{n+1}{2}$ (c) $\bar{x} + (n+1)$ (d) $\bar{x} - \frac{n+1}{2}$

42. The sum of n terms of two A P 's are in the ratio 5n+9:9n+6. Then, the ratio of there 18th term is

   (a) $\frac{179}{321}$ (b) $\frac{178}{321}$ (c) $\frac{175}{321}$ (d) $\frac{176}{321}$

43. If two tangents inclined at an angle of 60^0, are drawn to a circle of radius 3cm, then length of each tangent is equal to

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

44. The perpendicular bisector of the line segment joining the points A(1,5) and B(4,6) cuts the y-axis at

   (a) (0,13)   (b) (0,-13)   (c) (0,12)   (d) (13,0)

45. If the three sides of a triangle are $a, \sqrt{3}a$ and $\sqrt{2}a$, then the measure of the angle opposite to the longest side is

   (a) 45^0 (b) 30^0 (c) 60^0 (d) 90^0

46. A fast train takes 2 hours less for a journey of 300km in comparison to a slow train whose speed is 5km/hr less than that of the fast train. The speed of the fast train is equal to

(a) 30km/hr (b) 25km/hr   (c) 40km/hr   (d) 45km/hr

47. The pair of linear equations $7x - 3y = 4$, $3x + \frac{k}{7}y = 4$ is consistent only when

     (a) K= 9   (b) k= - 9   (c) k≠ −9   (d) $k \neq 7$.

48. If α, β be the zeros of the quadratic polynomial $5x + 2x^2 + 1$, then value of $\alpha + \beta + \alpha\beta$ is

(a) -2 (b) -1 (c) 1   (d) none of these

49. The largest number which divides 70 and 125, leaving remainders 5 and 8 respectively is

(a) 13   (b) 65   (c) 875   (d) 1750

50. If $\sin\theta - \cos\theta = 0$, then the value of $\sin^4\theta + \cos^4\theta$ is

(a) 1   (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) $\frac{1}{4}$

51. The area of a circle is $220cm^2$. The area of a square inscribed in it is

(a) $49cm^2$ (b) $70cm^2$ (c) $140cm^2$ (d) $150cm^2$

52. The area of the largest triangle that can be inscribed in a semi-circle of radius r is

     (a) $2r$ (b) r^2 (c) r   (d) $\sqrt{r}$

53. If HCF of 65 and 117 is expressible in the form of 65m-117, then value of m is

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

54. If sum of the squares of the zeros of the polynomials $6x^2+x+k$ is $\frac{25}{36}$ Then value of k is

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

55. In an AP $t_{18} - t_{14} = 32$, then its common difference is

     (a) 4   (b) 8   (c) -8   (d) -4

56. $\sin(45^0+A) - \cos(45^0 + A)$ is equal to

     (a) 2cosA   (b) 2sinA   (c) 0   (d) 1

57. The co-ordinates of the circumcentre of the triangle formed by the points O(0,0), P(x,0), Q(0,y) are

     (a) (x,y)   (b) $(\frac{x}{2}, \frac{y}{2})$ (c) $(\frac{x}{2}, \frac{y}{2})$ (d) (y,x)

58. A bag contains 5 red balls and some blue balls. If probability of drawing a blue ball from the bag is four times that of red ball, then

(a) number of blue balls in the bag is

(b) (a)18   (b)20   (c) 24   (d) 16

59. The abscissa of the point of intersection of less than type ogive and more than type ogive gives

(a) (a) mean   (b) mode   (c)median   (d)none of these

60. Volumes of two spheres are in the ratio of 64:27, there surface area is

(a) (a) 3:4   (b)4:3   (c) 9:16   (d) 16:9

61. The HCF of two numbers is 21 and their sum is 105, then the LCM of the numbers

   a) 189 or 147

   b) 126 or 84

   c) 84 or 145

   d) 84 or 105

62. If the eight-digit number 2575d568 is divisible by 54 and 87, the value of the digit 'd' is

   a) 4

   b) 7

   c) 0

   d) 8

63. A test has 50 questions. A student scores 1 mark for a correct answer, $-\frac{1}{3}$ for a wrong answer and $-\frac{1}{6}$ for not attempting a question. If the net score of a student is 32, the number of questions answered wrongly by that student cannot be less than

   a) 6

   b) 12

   c) 3

   d) 9

64. The number of real solutions of $(x^2 - 7x + 11)^{x^2 - 11x + 30} = 1$ is

   a) 4

   b) 5

   c) 6

   d) No solution

65. Out of a group of swans ,7/2 times the square root of the number of swans are playing on the shore of the tank. Remaining two are quarrelling in water. The total number of swans and the number of swans playing on the shore of the tank are
    a) 14,16
    b) 16,12
    c) 14,12
    d) 16,14

66. If $\frac{1}{p+q}, \frac{1}{q+r}, \frac{1}{r+p}$ are in A.P, then
    a) p,q,r are in A.P
    b) q^2, p^2, r^2 are in A.P
    c) p^2, q^2, r^2 are in A.P
    d) q,p,r are in A.P

67. If $9, a, b, -6$ are in arithmetic progression, then $a + b$ is
    a) 1
    b) 5
    c) 15
    d) 3

68. If $x + \frac{1}{x} = 3,$ then the value of $x^6 + \frac{1}{x^6}$ is
    a) 927
    b) 114
    c) 364
    d) 322

69. For the equation $3x^2 + px + 3 = 0$, if one of the roots is the square of the other, then the value of p is
    a) $-\frac{1}{3}$
    b) -1
    c) -6
    d) $\frac{2}{3}$

70. If the vertices of a triangle are $(1,2), (4, -6)$ and $(3,5)$, then
    a) The triangle is right-angled
    b) The area of the triangle is 12.5 sq. unit
    c) The points do not form a triangle
    d) None of these

71. Point on x-axis which is equidistant from the points (0,0) and (2,0) is
    a) (0,1)
    b) (1,1)
    c) (1,0)
    d) (0,2)

72. In a quadrant of radius 6a, two semi-circles with centres D and F are cut out as shown in the figure. If a circle with centre E is cut out as shown in the figure, then area (in sq. units) of the remaining part of the quadrant is
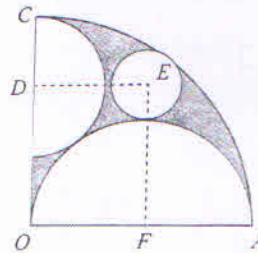

    a) $\frac{5}{2}\pi a^2$
    b) $\frac{1}{2}\pi a^2$
    c) $\frac{3}{2}\pi a^2$
    d) πa^2

73. If circumference of the base of a cylinder is 132 cm and its height is 10 cm, the volume of the cylinder will be
    a) 13860 cm^3
    b) 36450 cm^3
    c) 36540 cm^3
    d) 34560 cm^3

74. A card is drawn at random from a pack of 52 cards. The probability of getting a red card or an ace is
    a) $\frac{1}{3}$
    b) $\frac{1}{2}$
    c) $\frac{15}{26}$
    d) $\frac{7}{13}$

75. If the arithmetic mean of 9 observations is 100 and that of 6 observations is 80, then the combine mean of all the 15 observations will be
    a) 100
    b) 80
    c) 90
    d) 92

76. The value of $\frac{sin^4\theta - cos^4\theta}{1 - sin^2\theta}$ is

    a) $1 - cot^2\theta$

    b) $1 - tan^2\theta$

    c) $tan^2\theta - 1$

    d) $cot^2\theta - 1$

77. In the figure given below, if $l \parallel m \parallel n$ and $x = 125°$, then the value of $(z° - y°)$ is
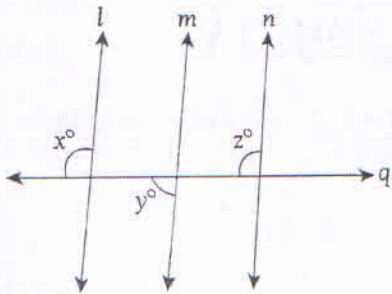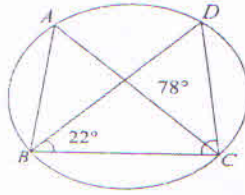

    a) $70°$
    b) $80°$
    c) $85°$
    d) $180°$

78. BD and CE are the bisectors of $\angle B$ and $\angle C$ of an isosceles triangle ABC with AB=AC. Which of the following is true?

    a) BD=AC
    b) BD=CE
    c) $\angle B = \angle A$
    d) $\angle C = \angle A$

79. The proportion of the angles of a quadrilateral is 2:5:7:4. What type of quadrilateral is it?

    a) Parallelogram
    b) Rhombus
    c) Cyclic Quadrilateral
    d) Trapezium

80. In the given figure, $\angle DBC = 22°$ and $\angle DCB = 78°$, then, $\angle BAC$ is equal to

   a) $90°$

   b) $80°$

   c) $78°$

   d) $22°$

MENTAL ABILITY

Directions (Q.81 to Q82) : Find the missing term(s) in the following patterns.

81. 93, 155, 217, 279, ?

   (a) 341

   (b) 433

   (c) 413

   (d) 373

82. ZA, XC, UF, ?

   (a) QJ   (b) KP

   (c) IR   (d) LO

83. If the ratio of two quantities A and B is 6 : 9 and a mixture of these two are prepared, then percentage of A in the mixture is

   (a) 32 1/3 %

   (b) 40%

   (c) 52 1/3 %

   (d) 60%

84. If Nitin finds that he is twelfth from the right in a line of boys and fourth from the left, how many boy should be added to the line such that there are 28 boys in the line?

   (a) 12   (b) 13

   (c) 14   (d) 20

(Q.85 to Q.89) : A solid cube of each side 12 cm, has been painted red, blue and black on pairs of opposite faces. It is then cut into cubical blocks of each side 2cm. On the basis of given information answer the following questions.

85. How many small cubes are painted on at least three surfaces?
    (a) 8   (b) 48
    (c) 16   (d) 24

86. How many small cubes are painted on exactly one surface?
    (a) 48   (b) 120
    (c) 64   (d) 9

87. How many small cubes are not painted on any surface?
    (a) 96   (b) 48
    (c) 64   (d) 80

88. How many small cubes are painted on at least two surfaces?
    (a) 96   (b) 48
    (c) 64   (d) 56

89. How many small cubes are painted on two surfaces?
    (a) 96   (b) 48
    (c) 64   (d) 120

90. Veer wants to go to the University. He starts from his home which is in the East and comes to acrossing. The road to the left ends in a theatre, straight ahead is the hospital. In which direction is the University?
    (a) North   (b) South
    (c) East   (d) West

91. Starting from a point P, Minal walked 20 meters towards South. He turned left and walked 30 meters. He then turned left and walked 20 meters. He again turned left and walked 40 meters and reached a point Q. How far and in which direction is the point Q from the point P?
    (a) 20 metres West (b) 10 metres East
    (c) 10 metres West   (d) 10 metres North

92. Pointing to a photograph, a woman says, "This man's son's sister is my mother-in-law." How is the woman's husband related to the man in the photograph?
    (a) Grandson   (b) Son
    (c) Son-in-law   (d) Nephew

Directions (Q.93 to Q.95) : Read both the given conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

93. Statements: All Tall are Short. All the Short are Thin.

Conclusions: Some Tall are Thin. No Thin is Short.

(a) Only conclusion (I) follows

(b) Only conclusion (II) follows

(c) Neither conclusion (I) nor (II) follows

(d) Both conclusions (I) and (II) are follow

94. Statements: Some Bats are Balls. No Ball is Stamp.

Conclusions: No Ball is Bat. Some Bats are not Stamps.

(a) Only conclusion (I) follows

(b) Only conclusion (II) follows

(c) Neither conclusion (I) nor (II) follows

(d) Both conclusions (I) and (II) are follow

95. Statements: Some Soldiers are Terrorist. Some Terrorist are Male.

Conclusions: No Soldier is male. Some Soldiers are male.

(a) Only conclusion (I) follows

(b) Only conclusion (II) follows

(c) Either conclusion (I) or (II) follows

(d) Both conclusions (I) and (II) are follow

96. At what time between 5 pm and 6 pm, hands of the clock are inclined at 45°?

(a) 19 1/11 minutes past 5

(b) 10 10/11 minutes past 5

(c) 10 20/11 minutes past 5

(d) 15 minutes past 5

97. Which year will have the same calendar as 2019?

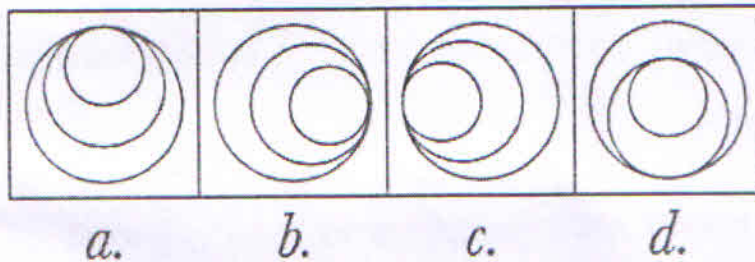(a) 2023   (b) 2022

(c) 2028   (d) 2030

98. On 11th Nov. 1989, it was Saturday. What was the day of the week on 11th Nov, 2012?

    (a) Thursday   (b) Friday

    (c) Sunday   (d) Wednesday

99. How many times do the hands of a clock are at right angle to each other in a day?

    (a) 11   (b) 22

    (c) 44   (d) 33

100. Find the odd one out.

a.   b.   c.   d.

***

Space for Rough Work

LR DAV APTITUDE TEST (2023)

Roll No. ☐☐☐☐☐☐☐☐☐   Set **A**

Time : 3 Hours

Guidelines to the Candidates:

1. This Booklet contains printed 14 pages and 2 blank pages for rough work. Any defect found should be brought to the notice of the invigilator immediately.

2. Fill in the particulars in the OMR Sheet given to you separately as per the directions given therein.

3. This test is of three hours' duration.

4. There are four choices in every question as (a), (b), (c) and (d). Only one is correct. Each question carries 4 marks.

5. (i) The test consists of 100 multiple choice questions comprising Mathematics (40), General Science (40) and mental ability (20) carrying maximum of 400 marks.

   (ii) -1 will be awarded for each wrong answer/multiple answer.

   (iii)No mark will be awarded for any overwriting/'scratching answer.

6. Each candidate must show his/her Admit Card to the invigilator whenever required.

7. No candidate shall leave his/her seat during examination.

8. Do not tear or remove any page of the Booklet.

9. For rough work the blank page at the end of the question booklet may be used. No calculator is allowed.

10. After finishing the test, the booklet with the OMR sheet is to be handed over to the invigilator before leaving the room.

MATHEMATICS

1. If one root of $(k-1)x^2+kx+1$ is -3, then value of k is

   (a) $\frac{4}{3}$ (b) $\frac{-4}{3}$ (c) $\frac{2}{3}$ (d) $\frac{-2}{3}$

2. The area of a triangle formed by the lines x=3, y=4 and x=y is

   (a) $\frac{1}{2}$ sq. unit (b) 1 sq. unit (c) 2 sq. units (d) none of these

3. If the equation $(a^2 + b^2)x^2 - 2(ac + bd)x + c^2 + d^2 = 0$ has equal roots , then

   (a) ab=cd (b) ad=bc (c) ad=$\sqrt{bc}$ (d) ab=$\sqrt{cd}$

4. If sum of the roots of the equation $x^2 - (k + 6)x + 2(2k - 1) = 0$ is equal to half of their product , then k=

   (a) 6 (b) 7 (c) 1 (d) 5

5. If sum of n terms of an A.P. is $3n^2 + 5n$, then which of its term is 164?

   (a) 26th (b) 27th (c) 28th (d) none of these

6. If three points (0,0), (3, $\sqrt{3}$) and (3,p) form an equilateral triangle , then p=

   (a) 2 (b) -4 (c) -3 (d) none of these

7. If P(2,4), Q(0,3), R(3,6) and S(5,y) are vertices of a parallelogram PQRS , then value of y is

   (a) 7 (b) 5 (c) -7 (d) -8

8. In $\triangle$ ABC, XY II BC, cuts AB at X and AC at Y. If BY bisects $\angle$XYC , then

   (a) BC=CY (b) BC=BY (c) BC$\neq$CY (d) BC$\neq$BY

9. If Cos θ=$\frac{2}{3}$, then $2Sec^2\theta + 2\tan^2\theta$ -7=

   (a) 1 (b) 0 (c) 3 (d) 4

10. $9Sec^2A - 9Tan^2A=$

    (a) 1 (b) 8 (c) 9 (d) 0

11. If perimeter of a semi-circular protractor is 108cm, then its diameter is

    (a) 36 cm (b) 24cm (c) 42cm (d) 48cm

12. The area of incircle of an equilateral triangle of side 42cm is

    (a) $22\sqrt{3}cm^2$ (b) 213 cm^2 (c) 924 cm^2 (d) 462 cm^2

13. If perimeter of a circle is equal to that of a square, then ratio of their areas is

    (a) 22:7 (b) 14:11 (c) 7:22 (d) 11:14

14. Volumes of two spheres are in the ratio 64:27. The ratio of their surface areas is

    (a) 1:2 (b) 2:3 (c) 9:16 (d) 16:9

15. The probability of throwing a number greater than 2 with a fair dice is

(a) $\frac{3}{5}$ (b) $\frac{2}{5}$ (c) $\frac{2}{3}$ (d) $\frac{1}{3}$

16. What is the probability that a leap year has 52 Mondays?

(a) $\frac{5}{7}$ (b) $\frac{6}{7}$ (c) $\frac{2}{7}$ (d) $\frac{4}{7}$

17. If $Sin\theta + Cos\theta = \sqrt{2}$, then $tan\theta + cot\theta =$

(a) 1   (b) -1   (c) -2   (d) 2

18. The point on X-axis which is equidistant from the points (-1,0) and (5,0) is

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

19. The area of a triangle formed by the line $\frac{x}{a} + \frac{y}{b} = 1$ with the coordinate axes is

(a) ab   (b) 2ab   (c) $\frac{1}{2}$ab   (d) $\frac{1}{4}$ab

20. If two tangents are inclined at an angle of 60° are drawn to a circle of radius 3cm , then length of each tangent is

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

21. The mean of n observations is $\bar{x}$. If the first observation is increased by 1, second by 2, the third by 3, and so on, then the new mean is

(a) $\bar{x} + (2n+1)$ (b) $\bar{x} + \frac{n+1}{2}$ (c) $\bar{x} + (n+1)$ (d) $\bar{x} - \frac{n+1}{2}$

22. The sum of n terms of two AP' s arein the ratio 5n+9:9n+6. Then, the ratio of their 18th term is

(a) $\frac{179}{321}$ (b) $\frac{178}{321}$ (c) $\frac{175}{321}$ (d) $\frac{176}{321}$

23. If two tangents inclined atan angleof 60^{0}, are drawn to a circle of radius 3cm, then length of each tangent is equal to

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

24. The perpendicular bisector of the line segment joining the pointsA (1,5) and B (4,6) cuts the y- axis at

(a) (0,13)   (b) (0, -13)   (c) (0,12)   (d) (13,0)

25. If the three sides of a triangle are a, $\sqrt{3}$a and $\sqrt{2}$a, then the measure of the angle opposite to the longest side is

(a) 45^{0} (b) 30^{0} (c) 60^{0} (d) 90^{0}

26. The value of θ for $\cos^4\theta - \sin^4\theta = \frac{1}{2}$ ($0 < \theta < 90^{0}$) is

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

27. The shadow of a tower standing on a level ground is x meters long when the sun's altitude is 30^0, while it is y metres long when the sun's altitude is 60^0. If the height of the tower is $45\frac{\sqrt{3}}{2}$ m, then the value of $x - y$ is

(a) 45m   (b) $45\sqrt{3}$ m   (c) $\frac{45}{\sqrt{3}}$ m   (d) $45\frac{\sqrt{3}}{2}$ m

28. The ratio in which the line segment joining the points A(-12,2) and B(8,3) is divided by the y-axis is

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

29. The pair of linear equations $7x - 3y = 4$ and $3x + \frac{k}{7}y = 4$ is consistent only when

(a)K= 9   (b)k= - 9   (c) k≠ −9   (d) $k \neq 7$.

30. If α, β be the zeros of the quadratic polynomial $5x+2x^2 + 1$, then value of $\alpha + \beta + \alpha\beta$ is

(a) −2   (b)−1   (c)1   (d) none of these

DIRECTIONS:

In the question number 31 to 35, a statement of **assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

31. **Assertion (A)** : Common difference of the AP having sum of n terms as $an^2 + bn$ is 2a.

    Reason (R) : If sum of n terms of an AP is denoted by S_n, then its nth term is $S_n - S_{n-1}$.

32. **Assertion (A)**: $\sqrt{2} + \sqrt{3}$ is an irrational number.

    Reason (R): Sum of two irrational numbers is irrational.

33. **Assertion (A)**: A die is thrown once. Then the probability of getting a number greater than 6 is 1.

    Reason (R) : Probability of an impossible event = 0.

34. **Assertion (A):** A parallelogram circumscribing a circle is a rhombus.

    Reason (R) : If two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre.

35. **Assertion (A):** If the median and mode of a distribution are 21.2 and 21.4 respectively, then its mean is 21.1.

Reason (R): Mean, median and mode are related by the relation mode = 2median − 3 mean.

CASE BASED QUESTION

The Figure given alongside shows the path of a diver, when she takes a jump from the diving board. Clearly it is a parabola.

Annie was standing on a diving board, 48 feet above the water level. She took a dive into the pool. Her height (in feet) above the water level at anytime 't' in seconds is given by the polynomial h(t) such that

$h(t) = -16t^2 + 8t + k$.
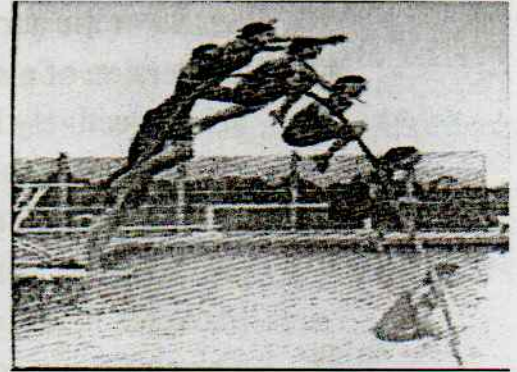
36. What is the value of k ?

     (a) 0   (b) - 48   (c) 48   (d) 48/-16

37. At what time will she touch the water in the pool?

     (a) 30 seconds   (b) 2 seconds   (c) 1.5 seconds   (d) 0.5 seconds

38. Rita's height (in feet) above the water level is givenby another polynomial P(t) with zeroes -1 and 2. Then p(t) is given by -

     (a) $t^2 + t - 2$

     (b) $t^2 + 2t - 1$

     (c) $24t^2 - 24t + 48$

     (d) $-24t^2 + 24t + 48$

39. A polynomial q(t) with sum of zeroes as 1 and the product as -6 is modelling Anu's height in feet above the water at any time t (in seconds). Then q(t) is given by

     (a) $t^2 + t + 6$

     (b) $t^2 + t - 6$

     (c) $-8t^2 + 8t + 48$

     (d) $8t^2 - 8t + 48$

40. The zeroes of the polynomial $r(t) = -12t^2 + (k-3) t + 48$ are negative of each other. Then k is

     (a) 3   (b) 0   (c) -1.5   (d) -3

GENERAL SCIENCE

41. Which one will help to accelerate the process of evaporation of a liquid kept in an open china dish?
    (a) Keeping the dish in open
    (b) Blowing air into the liquid
    (c) Keeping the dish under a running fan
    (d) All of the above

42. Dispersion of a solid in a liquid, a liquid in a gas and a liquid in a liquid are respectively known as:
    (a) Aerosol, emulsion, sol
    (b) Sol, aerosol, emulsion
    (c) Emulsion, sol, aerosol
    (d) Aerosol, sol, emulsion

43. The electronic configuration of Cl⁻ is:
    (a) 2, 8, 7
    (b) 2, 8, 8
    (c) 2, 8, 6
    (d) 2, 8, 8, 1

44. Which of the following has the highest no. of atoms?
    (a) 100 g of Na
    (b) 100 g of Al
    (c) 100 g of C
    (d) 100 g of O

45. Select the one that when used would be considered as best condition for liquification of a gas.
    (a) Increase the temperature
    (b) Decrease the pressure
    (c) Increase the pressure and decrease the temperature
    (d) Decrease the pressure and increase the temperature.

46. Identify the reducing agent in the following reactions:
    $Pb_3O_4 + 8HCl \rightarrow 3PbCl_2 + Cl_2 + 4H_2O$
    (a) Pb_3O_4
    (b) HCl
    (c) $PbCl_2$
    (d) Cl_2

47. Which of the following salts does not contain any water of crystallisation?
   (a) Blue vitriol
   (b) Washing soda
   (c) Baking soda
   (d) Gypsum

48. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that:
   (a) The food is not cooked completely
   (b) The fuel is not burning completely
   (c) The fuel is wet
   (d) The fuel is burning completely.

49. Identify the functional group in the following compound: $Br-CH_2-CH_2-CHO$
   (a) Aldehyde
   (b) Alcohol
   (c) Bromine
   (d) Both bromine and aldehyde.

50. Identify the wrong sequence of the elements in a group:
   (a) Ca, Sr, Ba
   (b) Cu, Au, Ag
   (c) N, P, As
   (d) Cl, Br, I

51. When a zinc strip is dipped in the blue solution of copper sulphate for some time, the colour of the solution changes to:
   (a) Pink
   (b) Green
   (c) Colourless
   (d) Remains blue

52. While preparing CO_2 in the laboratory, on which of the following substances HCl is poured?
   (a) Pieces of zinc
   (b) Pieces of marble
   (c) Crystals of copper sulphate
   (d) Ammonium chloride

53. Crypts of Lieberkühn are present in
    (a) pancreas and secrete pancreatic juice
    (b) stomach and secrete dilute HCl
    (c) small intestine and secrete digestive enzymes
    (d) stomach and secrete trypsin

54. Which one of the following pairs matches a hormone with a disease resulting from its deficiency?
    (a) Relaxin- gigantism
    (b) Prolactin- cretinism
    (c) Parathyroid hormone- tetany
    (d) Insulin-diabetes insipidus

55. Prokaryotic genome consists of
    (a) DNA with histones
    (b) DNA without histones
    (c) DNA or histones
    (d) Histones only

56. The major component of the cell wall in bacterial prokaryotes is a polymer named
    (a) Cellulose
    (b) Chitin
    (c) Xylan
    (d) Peptidoglycan

57. Afferent nerve fibre carries impulses from
    (a) Effector to central nervous system
    (b) Receptors to central nervous system
    (c) central nervous system to muscles
    (d) central nervous system to receptors

58. Lining of intestine in man is
    (a) Ciliated
    (b) Keratinized
    (c) Brush bordered
    (d) Nonkeratinized

59. Pectin of cell wall is
    (a) excretory product
    (b) waste product
    (c) secretory product
    (d) all of these

60. A phylum that includes exclusively marine animals is
   (a) Porifera
   (b) Coelenterata
   (c) Protozoa
   (d) Echinodermata

61. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny of all bore violet flowers but almost half of them were short. This suggests that the genetic make-up of the tall parent can be depicted as
   (a) TTVV
   (b) TTvv
   (c) TtVV
   (d) TtVv

62. Which of the following option shows the transport of oxygen to the cell correctly?
   (a) Lungs- pulmonary vein – right atrium – right ventricle – aorta – body cells
   (b) Lungs- pulmonary vein – left atrium – left ventricle – aorta – body cells
   (c) Lungs- pulmonary artery– left atrium – left ventricle – vena cava – body cells
   (d) Lungs- pulmonary artery– right atrium – right ventricle – vena cava – body cells

63. A body of mass m is moving in a circle of radius r with a constant speed v. The force on the body is $\frac{mv^2}{r}$ and is directed towards the centre. What is the work done by this force in moving the body over half the circumference of the circle

   (a) $\frac{mv^2}{\pi r^2}$ (b) Zero

   (c) $\frac{mv^2}{r^2}$ (d) $\frac{\pi r^2}{mv^2}$

64. If the unit of force and length each be increased by four times, then the unit of energy is increased by

   (a) 16 times   (b) 8 times
   (c) 2 times   (d) 4 times

65. A man pushes a wall and fails to displace it. He does

   (a) Negative work
   (b) Positive but not maximum work

(c) No work at all

(d) Maximum work

66. The same retarding force is applied to stop a train. The train stops after 80 m. If the speed is doubled, then the distance will be

(a) The same   (b) Doubled

(c) Halved   (d) Four times

67. Two identical solid copper spheres of radius R placed in contact with each other. The gravitational attraction between them is proportional to

(a) R^2 (b) R^{-2}

(c) R^4 (d) R^{-4}

68. If the earth rotates faster than its present speed, the weight of an object will

(a) Increase at the equator but remain unchanged at the poles

(b) Decrease at the equator but remain unchanged at the poles

(c) Remain unchanged at the equator but decrease at the poles

(d) Remain unchanged at the equator but increase at the poles

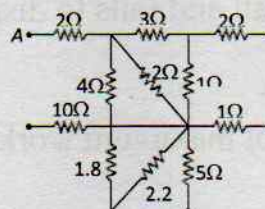69. A water drop in air refracts the light ray as
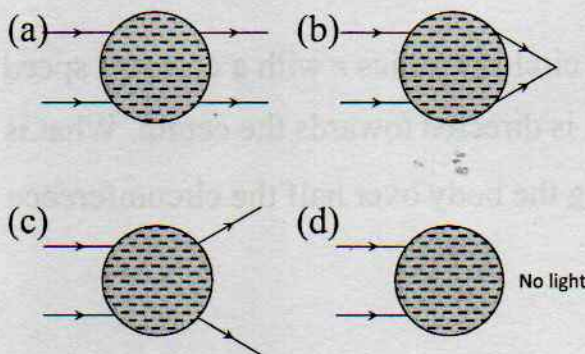
70. A thin rod of 5 cm length is kept along the axis of a concave mirror of 10 cm focal length such that its image is real and magnified and one end touches the rod. Its magnification will be

(a) 1   (b) 2

(c) 3   (d) 4

71. What is the equivalent resistance between the points A and B of the network

(a) $\frac{57}{7}\,\Omega$

(b) $8\,\Omega$

(c) $6\,\Omega$

(d) $\frac{57}{5}\,\Omega$

DIRECTIONS:

In the question number 72 to 76, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct option

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

72. **Assertion(A)** : Stimulus is interpreted by the brain and not by the sense organs.

    Reason(R) : Sense organs act as transducers, transforming the stimulus energy into impulse energy.

73. **Assertion(A)**: Electronegativity of Fluorine is greater than that of oxygen.

    Reason(R): The electronegativity of the elements increases along a period since metallic character increases.

74. **Assertion (A)** : A person working on a horizontal road with a load on his head does no work

    Reason (R) : No work is said to be done, if directions of force and displacement of load are perpendicular to each other.

75. **Assertion (A)**:The work done during a round trip is always zero.

    Reason (R):No force is required to move a body in its round trip.

76. **Assertion (A)**: Critical angle of light passing from glass to air is minimum for violet colour.

    Reason (R) :The wavelength of blue light is greater than the light of other colours.

CASE BASED QUESTION

Human digestive system consists of main organs buccal cavity, oesophagus, stomach, small intestine and large intestine leading into rectum and anus. Salivary glands, liver, pancreas act as accessory organs. Various others glands like crypts of Lieberkühn, Bruner's glands also play an important role. Enzymes secreted from various glands helps in the

process of digestion. Intestinal juice contains enterokinase also called as activator enzyme.

77. In which of the following, proteins are absent?
    (a) pancreatic juice
    (b) saliva
    (c) bile
    (d) intestinal juice
78. During prolonged fasting the sequence of organic compounds used by body is
    (a) carbohydrates, fats, proteins
    (b) fats, carbohydrates, proteins
    (c) carbohydrates, proteins, lipids
    (d) protein, lipids, carbohydrates
79. Brunner's glands are found in
    (a) stomach
    (b) ileum
    (c) colon
    (d) duodenum
80. Pepsin acts in
    (a) basic medium
    (b) acidic medium
    (c) neutral medium
    (d) all types of media

Mental Ability

81. Kamal remembers that her brother Dinu's birthday falls after 20th May but before 28th May, while Garima remembers that Dinu's birthday falls before 22nd may but after 12th MAY on what date Dinu's birthday falls?

    a) 22nd May   b) 21ST May   c) Can't be determine   d) None of these

82. What is the missing number in the given series?
    50,30,40,75,170, ?
    a) 360   b) 450   c) 320   d) 295
83. In a certain code language " ACTIVATE" is coded as "BCUIWAUE". How is "CATALYST" coded in that language?

    a) ADYMYUAT   b) ADMYUATT   c) DAUAMYTT   d) DUAAMYTT

84. The given options show four time instances. In which of these cases, the hour hand and minute hand will be closest to each other when this time is seen on a clock?

    a) 4:00   b) 10:00   c) 6:30   d) 2:15

85. A boy walked 931m to the north, then he turns to his left and walks 31 m. After that, he moves 931m to his left and finally he turns to the right and moves 23 m. How far is he from the starting point?

   a)31m   b)54m   c)93m   d)99m

86. If L stands for +, M stands for -, N stands for ×, P stands for ÷, then What is the value of 14N10L42P2M8 ?

   a)150   b)143   c)153   d)160

87. Select one of the following four option that will make the second pair analogous to the first pair given as:

     KABADDI : 7 :: BASKETBALL : ?
   a)5   b)6   c)8   d)9

88. Find out the conclusions which logically follows from the given statements disregarding commonly known facts.
statements: some dogs are cats
          All cats are pigs.
Conclusions: I) some cats are dogs.
           II) some dogs are pigs.
a) only conclusion I follows
b) only conclusion II follows
c) either conclusion I OR II follows
d) both conclusion I and II follows.

89. Find out the conclusions which logically follows from the given statements disregarding commonly known facts.
Statements: All stones are water.
          Some water are clean.
Conclusions: I) some water are stones.
         II) all clean are water.

a) only conclusion I follows
b) only conclusion II follows
c) either conclusion I OR II follows
d) both conclusion I and II follows.

90. A list of meaningful words are given in the option. In which case ,the word formed has atleast a pair of consecutive alphabets?
   a) CLEAR   b)FORCE   c)CRANE   d) BLUSH

91. A woman said to a man, "The daughter of your only sister is the sister of my husband".What is the relation of man's sister to the woman?
   a)Mother   b)Mother-in-law   c)Data inadequate d)None of these.

92. If Thurseday falls 2 days after tomorrow, then what day of the week was it in three days before yesterday?
    a)Monday   b)Tuesday   c)Wednesday   d)Thursday

93. Thailand : Baht :: Myanmar : -----------?
    a)Peso   b)Kyat   c)Dinar   d)Rial

94. Rabbit : Leap :: Duck : ----------?
    a)Fly   b)Swoop   c)Flit   d)Waddle

95. Mohan and Sujit are ranked seventh and eleventh respectively from the top in a class of 31 students. What will be their respective ranks from the bottom in the class ?
    a) 20th and 24th b) 24th and 20th
    c) 25th and 21st d) 26th and 22nd

96. Vishal is elder than Akash but younger than Shivansh, Yaksh is younger than Deepak but elder than Akash. If Shivansh is younger than Deepak, then who is eldest?
    a)Akash   b)Vishal   c)Shivansh   d)Deepak

Directions(97-98): A big cube is painted with red color. Then it is cut into some small cubes in such a way that the length of small cube is (1/7)th of the length of big cube. now answer the following questions.

97. How many small cubes are there in all?
    a)342   b)343   c)340   d)431

98. How many small cubes do not have any of the faces painted?
    a)120   b)115   c)124   d)125

Direction(99-100):Read the following information carefully. And answer the following questions.

D,E,F,H,I are seated in a circle facing toward the center. A,B,C are also seated in the same circle but two of them are not facing the center. F is sitting 2nd to the left of C. E is 3rd to the right of A. B is 3rd to the left of D, who is immediate neighbour of H and I. C is second to the right of D and third to the right of B.

99. If H is sitting on the immediate right of E then what is possible position of H with respect to C?
    a)Immediate right   b)3rd to the right   c)3rd to the left   d) 2nd to the left

100. Which of the following pair facing outside?
    a) AE   b) CE   c) CB   d) HI

***

SPACE FOR ROUGH WORK

APTITUDE TEST FOR ADMISSION INTO +2 SCIENCE (2024-25)

ROLL NO. [ ][ ][ ][ ][ ][ ][ ][ ][ ]

Time: 3 Hours

SET **C**

(9.00 am – 12.00 noon)

Guidelines to the Candidates:

➢ This Booklet contains printed 15 pages and 1 blank page for rough work. Any defect found should be brought to the notice of the invigilator immediately.

➢ Fill in the particulars in the OMR Sheet given to you separately as per the directions given therein.

➢ This test is of three hours duration.

➢ The question paper consists of 100 multiple choice questions comprising of Mathematics (40), General Science (40) and Aptitude (20) carrying maximum of 400 marks.

➢ There are four choices in every question as (a), (b), (c) and (d). Only one is correct. Each question carries 4 marks.

➢ -1 will be awarded for each wrong answer/multiple answer.

➢ No mark will be awarded for any overwriting/scratching answer.

➢ No candidate shall leave his/her seat during examination.

➢ Do not tear/remove any page of the Booklet.

➢ Calculation, if any, may be done at the blank page of this booklet provided at the end for rough work. No calculator is allowed.

➢ After finishing the test, the booklet with the OMR sheet is to be handed over to the invigilator before leaving the room.

APTITUDE TEST

1. Solve the following analogy.

   Horse: Stable: Pig: ------

   (a) Den   (c) Sty

   (b) Byre   (d) Hive

2. Find the odd one.

   (a) 256   (c) 1331

   (b) 576   (d) 441

Direction (Q3 - 6): Here you have to assume the given statements to be true even if they differ from generally known facts. Study all the conclusions and then decide which of the conclusions logically follows.

Give answer as

a) If both I and II follow

b) If only conclusion II follows

c) If either I OR II follows

d) If neither I nor II follows

3. Statements: Some rooms are stones.

   All stones are radios.

   Conclusions: I. some rooms are radios.

   II. some stones are rooms.

4. Statements: All roads are poles.

   No pole is house.

   Conclusions: I. some roads are houses.

   II. Some houses are poles.

5. Statements: All birds are trees.

   Some trees are hens.

   Conclusion: I. some birds are hens.

   II. Some hens are trees.

6. Statement: All tables are chalks.

   All chalks are chairs.

   Conclusions: I) All chairs are tables.

   II) All tables are chairs.

7. If A is the father of B and B is the father of C, then how is C related to A?

   (a) Grandson

   (b) Grand daughter

   (c) Grandfather

   (d) Can't be determined.

8. What day of the week was on 13th April, 1723?

   (a) MONDAY

   (b) TUESDAY

   (c) WEDNESDAY

   (d) FRIDAY

9. Solve the following analogy.

   AZCX: BYDW: HQJO: --------

   (a) GREP   (c) IPKN

   (b) IPKM   (d) GRJP

10. Sam ranked 9th from the top and 38th from the bottom in a class. How many students are there in the class?

   (a) 46   (c) 45

   (b) 47   (d).48

11. If 34 is related to 12, in the same way 59 is related to-----.

   (a) 38   (c) 26

   (b) 45   (d) 14

12. How many meaningful English words can be formed with the letter ESRO using each letter once in each word?

   (a) None   (c) Two

   (b) One   (d) Three

13. If you write down all the numbers from 1 to 100, then how many times do you write 3?

   (a) 19   (c) 21

   (b) 11   (d) 20

14. A shepherd has 17 sheep. All but nine died. How many was he left with?

   (a) None   (c) 9

   (b) 8   (d) 17

15. Nitin ranks 18th in the class of 49 students. What is his rank from the last?

(a) 18   (c) 19

(b) 31   (d) 32

16. In a cricket match there are three types of tickets say A, B and C each costing Rs.1000, Rs. 500 and Rs. 200 respectively. The ratio of the ticket sold of category A, B and C I 3 : 2 : 5. If the total collection from selling the tickets is Rs. 2.5 crore. Find the total number of tickets sold.

(a) 50000

(b) 40000

(c) 45000

(d) 60000

17. The ratio of ages of two boys is 5 : 6. After two years the ratio will be 7 : 8. The ratio of their age after 12 years will be :

(a) 22 : 24

(b) 15 : 16

(c) 17 : 18

(d) 11 : 12

18. In a school, the ratio of boys to girls is 4 : 3 and the ratio of girls to teachers is 8 : 1. The ratio of students to teachers is

(a) 56 : 3

(b) 55 : 1

(c) 49 : 3

(d) 56 : 1

19. There is a ratio of 5 : 4 between two numbers. If 40 per cent of the first is 12, then 50% of the second number is :

(a) 18

(b) 12

(c) 42

(d) 20

20. The average age of boys in the class is twice the number of girls in the class. The ratio of boys and girls in the class of 50 is 4 : 1. The sum of the ages (in years) of the boys in the class is :
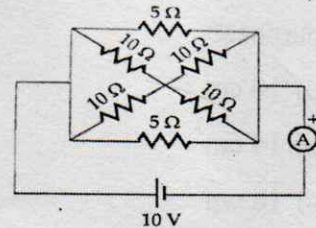
(a) 2000

(b) 2500

(c) 800

(d) 400

GENERAL SCIENCE

21. An electric bulb is marked 100 W, 230V. If the supply drops to 115 V, what is the heat energy produced by the bulb in 20 min? Calculate the current flowing through it.

    (a) 50 kJ and $\frac{5}{23}$A

    (b) 35 kJ and $\frac{2}{11}$A

    (c) 30 kJ and $\frac{5}{23}$ A

    (d) 40 kJ and $\frac{2}{11}A$

22. Calculate the amount of current flowing through the circuit.

    (a) 5 A

    (b) 4A

    (c) 2.5A

    (d) 8A

23. A cylindrical wire P has resistance 10Ω. A second wire Q has length and diameter half that of P. If the material of both the wires is same, then resistance of wire Q is

    (a) 10Ω   (b) 20Ω   (c) 5Ω   (d) 5 2 Ω

24. Ten one-rupee coins are put on top of each other on a table. Each coin has mass m. The reaction of the 6th coin (counted from the bottom) on the 7th coin is

    (a) 4mg   (b) 6mg

    (c) 7mg   (d) 3mg

25. The speed-time graph of a particle moving along a fixed direction is as shown in the figure. The distance traversed by the particle between t = 0 s to t = 10 s is
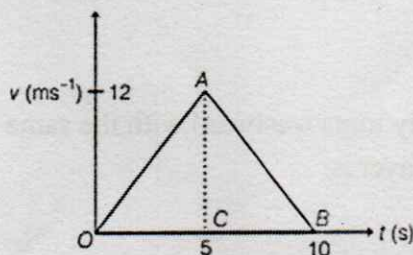
    (a) 20 m   (c) 40 m

    (b) 60 m   (d) 80 m

26. A small magnet is placed perpendicular to a uniform magnetic field. The force acting on the magnet will result in

    (a) Rotational motion

    (b) Translational motion

    (c) No motion at all

    (d) Translational and rotational motion both

27. A glass slab is placed in the path of a beam of convergent light, then the point of convergence of light
   (a) Moves towards the glass slab
   (b) Moves away from the glass slab
   (c) Remains at the same point
   (d) Undergoes a lateral shift

28. A virtual, erect and magnifiede image of an object is to be produced with a concave mirror of focal length 12 cm. Which of the following object distance should be chosen for this purpose?
   (a) 10 cm
   (b) 14 cm
   (c) 18 cm
   (d) 24 cm

29. A stone is projected vertically up to reach maximum height h. The ratio of its kinetic energy to its potential energy at a height 4/5 h, will be
   (a) 5 : 4   (b) 4 : 5
   (c) 1 : 4   (d) 4 : 1

30. A spherical mirror forms an erect image four times the size of the object. If the distance between the object and the image is 100 cm, the nature and the focal length of the mirror are
   (a) Concave, (80/3) cm
   (b) Convex, (80/3) cm
   (c) Concave, 20 cm
   (d) Convex, 20 cm

31. A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponent. The force that acts on the player is
   (a) Frictional force along westward
   (b) Muscle force along southward
   (c) Frictional force along south-west
   (d) Muscle force along south-west

32. An observer standing at the sea coast observes 54 waves reaching the coast per minute. If the wavelength of the waves is 10 m, find the velocity.
   (a) 54 m/s
   (b) 10 m/s
   (c) 9 m/s
   (d) 5.4 m/s

33. A metal salt MX when exposed to light splits up to form metal M and a gas X_2. Metal M is used in making ornaments whereas gas X_2 is used in making bleaching powder. What could be the metal M and the gas X_2 respectively?

    (a) Gold, oxygen   (b) gold, chlorine   (c) silver, oxygen   (d) silver, chlorine

34. Among the following reactions, which is a redox reaction?

    (a) $CaCO_3$ (s) $\longrightarrow$ CaO (s) + CO_2 (g)
    (b) Mg (s) + CuO (s) $\longrightarrow$ MgO (s) + Cu(s)
    (c) $NaOH$ (aq) + HCl (aq) $\longrightarrow$ $NaCl$ (aq) + H_2O (l)
    (d) KBr (aq) + $AgNO_3$ (aq) $\longrightarrow$ KNO_3 (aq) + $AgBr$ (s)

35. Match the acids given in column (I) with their correct source given in column (II) and choose the correct option.

Column (I)	Column (II)
(A) Lactic acid	(i) Lemon
(B) Citric acid	(ii) Tomato
(C) Acetic acid	(iii) Vinegar
(D) Oxalic acid	(iv) Curd

    (a) A – ii, B – iii, C – iv, D – i   (c) A – iv, B – i, C – ii, D – iii
    (b) A – iv, B – i, C – iii, D – ii   (d) A – ii, B – iii, C – i, D – iv

36. Which of the following should be the correct order of decreasing value of 2nd ionisation potential of $_6C$, $_7N$, $_8O$ and $_9F$?

    (a) F > O > N > C   (b) O > F > N > C   (c) O > F > C > N   (d) F > N > O > C

37. Which of the following compounds have highest electronegativity?

    (a) Ethane   (b) ethene   (c) ethyne   (d) equal in all

38. Match column I with column II and select the correct answer from the codes given below the columns:

Column (I)	Column (II)
(A) Radioactive	(i) Pt
(B) Lightest metal	(ii) I_2
(C) Noble metal	(iii) Li
(D) Liquid non-metal	(iv) U
(E) Solid volatile non-metal	(v) Br_2
	(vi) H

	A	B	C	D	E
(a)	iv	iii	i	v	ii
(b)	iv	vi	i	v	ii
(c)	i	iii	iv	v	ii
(d)	i	vi	iv	v	ii

39. Riva took a thin strip of filter paper. She did an experiment by putting a small drop of green ink on the baseline drawn 3 c.m. above one of the shortest edges of filter paper and inserting the paper into a jar containing water so that the drop of ink on the paper is just above the water level. She found that the position of blue color pigment is higher than that of yellow. What type of experiment was performed by Riva and which color is more soluble in water?
    (a) Paper chromatography, yellow
    (b) Paper chromatography, blue
    (c) Column chromatography, green
    (d) Column chromatography, yellow

40. Carbon and hydrogen combine in the ratio of 4:1 by mass to form ethane. What mass of hydrogen gas would be required to react completely with 36 g of carbon?
    (a) 6 g   (b) 9 g   (c) 12 g   (d) 3 g

41. Stomata are epidermal outgrowths present on epidermal surfaces of leaf and young stem. The stomata are restricted to ----- in monocot leaves.
    (a) Lower epidermis
    (b) Upper epidermis
    (c) Mesophyll zone
    (d) Both lower and upper epidermis.

42. Enzymes enhance the rate of metabolic processes by:
    (a) Lowering of the activation energy.
    (b) Increasing the activation energy.
    (c) Without changing the activation energy.
    (d) Either lowering or increasing the activation energy.

43. Myogenic muscles are the:
    (a) Specialized muscles in the mammalian gut.
    (b) Specialized muscles in the mammalian heart.
    (c) Specialized muscles in the mammalian pancreas.
    (d) Specialized muscles in the mammalian kidney.

44. The given characteristic features represent in which phylum?
            1) Their body is porous.
            2) Spongocoel is lined by choanocytes or collar cells.
            3) They have cellular level of organisation.
            4) Water transport or water canal system is present.

    Select the correct option:

    (a) Echinodermata
    (b) Ctenophora
    (c) Porifera
    (d) Platyhelminthes

45. Haemoglobin is responsible for transport of oxygen in blood. It represents which level of structure of protein arrangement?
    (a) Primary structure
    (b) Secondary structure
    (c) Tertiary structure
    (d) Quarternary structure.

46. Which of the following is incorrect with respect to significance of meiotic division?

    (a) New recombination of genes.

    (b) Number of chromosomes become half.

    (c) Number of chromosomes remain same.

    (d) Formation of spores and gametes.

47. On selfing a plant of genotype RrTt, 400 plants were raised. How many of them will be of genotype RrTt?
    (a) 50
    (b) 100
    (c) 200
    (d) 300

48. Choose the chromosome in a human that possesses the least number of genes.
    (a) 21st chromosome
    (b) Autosome
    (c) X- chromosome
    (d) Y- chromosome

49. Darwin judged the fitness of individuals by:
    (a) Ability to defend itself.
    (b) Strategy to obtain food.
    (c) Number of offsprings produced.
    (d) Dominance over other individuals.

50. The diagnostic test that confirms typhoid in humans is :
    (a) ELISA
    (b) Widal
    (c) MRI
    (d) Amniocentesis

51. The organ in humans that undergo degeneration with increase in age and related to immune system is:
    (a) Spleen
    (b) Pancreas
    (c) Liver
    (d) Thymus

52. Regeneration of damaged growing grass following grazing is largely due to:

(a) Lateral meristem

(b) Intercalary meristem

(c) Apical meristem

(d) Secondary metabolites

53. Choose the wrong statements for the specialized connective tissue:

1) All of the cartilages in vertebrate embryos are replaced by bones in adults.

2) Cartilage is present in the tip of nose, outer ear joints, between adjacent bones of the vertebral column, limbs and hands in adults.

3) Osteocytes are bone cells and present in the spaces called lacunae.

4) Bone marrow is present in all bones and it is a site of production of blood cells.

5) Blood is a fluid connective tissue.

(a) 1,2 and 5

(b) 1,3 and 5

(c) 1 and 4

(d) 4 and 5

For question numbers 54,55 and 56, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a)   Both A & R are true and R is the correct explanation of A.

(b)   Both A & R are true but R is NOT the correct explanation of A.

(c)   A is true but R is false.

(d)   A is false and R is also false.

54. Assertion: As we go up the surface of the earth, we feel light weighed than on the surface of the earth.

Reason: The acceleration due to gravity decreases on going up above the surface of the earth.

55. Assertion: Sodium are obtained by the electrolysis of its molten chloride, i.e., NaCl.

Reason: Na is deposited at the anode and Cl_2 is deposited at the cathode.

56. Assertion : Iodine is necessary for normal rete of hormone synthesis.

Reason : Deficiency of iodine cause diseases.

Read the following paragraph and answer the questions : (57 to 60)

Acid and base undergo neutralisation reaction to form salt which is an ionic compound. Salt is composed of related number of cations, those coming from base and anions, those coming from acid. Thus, salt is electrically neutral. They may be simple salts such as $NaCl$, KCl; acid salts like $NH_4)_2SO_4$; basic salts like CH_3COONa; double salt like $K_2SO_4.Al_2(SO_4)_3$.

57. Which one of the following salts does not contain water of crystallisation?
    - (a) Green vitriol
    - (b) Blue vitriol
    - (c) gypsum
    - (d) baking soda

58. Potassium sulphate is a salt of
    - (a) Strong acid and weak base
    - (b) Strong base and weak acid
    - (c) Strong acid and strong base
    - (d) Weak acid and weak base

59. What will be the product when Al_2O_3 reacts with $NaOH$?
    - (a) Aluminium hydroxide and sodium oxide
    - (b) Sodium aluminate and water
    - (c) Aluminium hydride and sodium oxide
    - (d) Sodium aluminate and hydrogen gas

60. What happens when a solution of an acid is mixed with a solution of a base in a test tube?
    - (ii)   Temperature of the solution decreases
    - (iii) Temperature of the solution increases
    - (iv)   Temperature of the solution remains the same
    - (v)   Salt formation takes place

    (a) (i) & (iv)   (b) (i) & (iii)   (c) (ii) only   (d) (ii) & (iv)

MATHEMATICS

61. 150 litres of milk contain 20% of water. The amount of water to be added so that amount of water will be 25%, is
    - (a) 20 litres
    - (b) 10 litres
    - (c) 15 litres
    - (d) 30 litres

62.
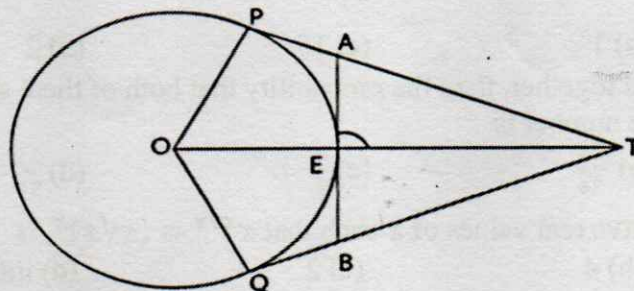
In the above figure, O is the centre of a circle of radius 5 cm, T is a point such that OT = 13cm and OT intersects the circle at E, if AB is the tangent to the circle at E, then the length of AB is

(a) $\frac{10}{3}$ cm   (b) 12cm   (c) 17cm   (d) $\frac{20}{3}$ cm

63. Three horses are tethered with 7 meter long ropes at the three corners of a triangular field having sides 20 m, 34 m and 42 m. The area of the plot which can be grazed by the horses is
    (a) 80m²   (b) 100m²   (c) 77m²   (d) 30m²

64. If the point (2, 3) is equidistant from the points (a + b, b−a) and (a−b, a +b), then
    (a) 2a = 3b (b) a + b=1   (c) 3a = 2b   (d) b−a=1

65. The area of in-circle of an equilateral triangle of side 42cm is
    (a) $22\sqrt{3}cm^2$ (b) 213 cm^2 (c) 924 cm^2 (d) 462 cm^2

66. Asha has only Rs.1 and Rs.2 coins with her. If the total number of coins that she has, is 50 and the amount of money with her is Rs.75, then the number of Rs.1 and Rs.2 coins are, respectively
    (a) 35 and 15
    (b) 15 and 35
    (c) 35 and 20
    (d) 25 and 25

67. The value of k, for which the system of equations x + (k + 1)y = 5 and (k + 1) x + 9y = 8k − 1 has infinitely many solutions, is
    (a) 2   (b)3   (c) 4   (d)5

68. If among three numbers the mean of first two numbers is 2, mean of last two numbers is 3 and mean of first and last number is 4, then the mean of these three numbers is
    (a) 3   (b) 3.5   (c) 9   (d) 4.5

69. Let the rational number p/q be closest to but not equal to 22/7 among all rational numbers with denominator less than 100. The value of $p - 3q$ is
    (a)12   (b)14   (c) 21   (d) 22

70. The largest number which divides 31 and 99, leaving remainders 5 and 8 respectively, is
    (a) 13   (b)65   (c) 875   (d) 1750

71. If $\sin y + \sin^2 y = 1$, then $\cos^2 y + \cos^4 y = ?$
    (a) 0   (b) −1   (c) 1   (d) 2

72. In the quadratic equation $ax^2 + b x +c = 0$, If one root is four times the other, which of the following relation is correct?
    (a) $3b^2 = 24ac$ (b) $4b^2 = 25ac$ (c) $5b^2 = 24ac$ (d) $3b^2 = 25ac$

73. If 3 is the least prime factor of m and 5 is the least prime factor of n, then the least prime factor of (m + n) is
    (a) 11   (b) 1   (c) 15   (d) 2

74. If two dice are rolled together, then the probability that both of them shows either a prime or a composite number is
    (a) $\frac{13}{18}$ (b) $\frac{25}{36}$ (c) $\frac{2}{3}$ (d) $\frac{11}{36}$

75. The number of positive real values of x such that $x^{x\sqrt{x}} = (x\sqrt{x})^x$, is
    (a) 1   (b) 4   (c) 2   (d) infinite

76. If a, b, c, d, e are in A.P., then the value of (a − 4b + 6c − 4d + e) is
    (a) 0   (b) 1   (c) −1.   (d) 2

77. The number of rows in a lecture hall equals the number of seats in a row. If the number of rows is doubled and the number of seats in every row is reduced by 10, the number of

seats is increased by 300. If x denotes the number of rows in the lecture hall, then the values of x is

(a)10   (b) 15   (c) 20   (d) 30

78. If $(0,0)$, $(a,1)$ and $(10,5)$ are colinear then the value of 'a' is

(a) 1   (b) -1 (c) 2   (d) -2

79. If α and β are the roots of the equation $x^2 - 2x + 4 = 0$, then the value of $(\alpha^3 + \beta^3)$ is

(a) 16   (b) -16 (c) 8   (d) -8

80. A vessel is in the form of an inverted cone. Its height is 8 cm and radius of its top, which is open, is 5cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5cm are dropped into the vessel, one fourth of the water flows out. Then the number of lead shots dropped in the vessel are

(a) 500   (b) 300   (c)200   (d)100

81. The value of $sin^2 5° + sin^2 10° + sin^2 15° + \cdots + sin^2 90°$ is equal to:

(a) 8   (b) 8.5   (c) 9.5   (d)9

82. In a ΔABC, the internal bisectors of $\angle B$ and $\angle C$ meet at P and the external bisectors of $\angle B$ and $\angle C$ meet at Q. Then $\angle BPC + \angle BQC =$?

(a) 60°   (b) 45°   (c) 90°   (d) 180°

83. If the difference of mode and median of a data is 24, then the difference of median and mean is

(a) 12   (b) 24   (c) 8   (d)36

84. If r and s are roots of $x^2 + px + q = 0$, then what is the value of $\frac{1}{r^2} + \frac{1}{s^2}$?

(a) $p^2 - 4q$ (b) $\frac{p^2-4q}{2}$ (c) $\frac{p^2-4q}{q^2}$ (d) $\frac{p^2-2q}{q^2}$

85. The sum of n terms of two A. P are in the ratio (5n+4):(9n+6), then the ratio of their 18th terms is

(a) $\frac{47}{84}$ (b) $\frac{179}{321}$ (c) $\frac{89}{159}$ (d) $\frac{2}{3}$

86. The maximum volume of a cone that can be carved out of a solid hemisphere of radius r is

(a) $3\pi r^2$ (b) $\frac{\pi r^3}{3}$ (c) $\frac{\pi r^2}{3}$ (d) $3\pi r^3$

87. The sum of the length, breadth and height of a cuboid is $6\sqrt{3}$ cm and the length of its diagonal is $2\sqrt{3}$ cm. The total surface area of the cuboid is

(a) $48cm^2$ (b) $72cm^2$ (c) $96cm^2$ (d) $108cm^2$

88. If $1/(b+c)$, $1/(c+a)$, $1/(a+b)$ are in AP then

(a) a, b, c are in AP

(b) a², b², c² are in AP

(c) 1/1, 1/b, 1/c are in AP

(d) None of these

89. If a cone is cut into two parts by a horizontal plane passing through the mid-point of its axis, then the volume of the upper part and the cone is

(a) 1:8   (b)1:5   (c)1:7   (d)1:6

90. If 35 is removed from the data:30, 34, 35, 36, 37, 38, 39, 40, then the median increases by

(a) 2   (b)1.5   (c)1   (d) 0.5

91. Two numbers 'a' and 'b' are selected successively without replacement in that order from the integers 1 to 10. The probability that $\frac{a}{b}$ is an integer, is

(a) $\frac{17}{45}$ (b)$\frac{1}{5}$ (c) $\frac{17}{90}$ (d)$\frac{8}{45}$

92. In the following figure, O is the centre of the circle. The value of the angle $\angle RSQ$ is
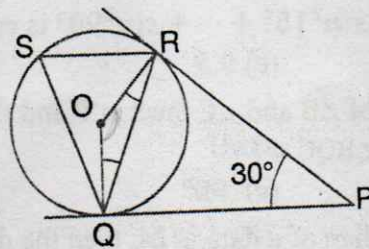
(a) 60°   (b) 75°   (c) 150°   (d) 45

Question no 93, 94, 95 and 96 are assertion-reason based questions in

which a statement of Assertion (A) is followed by a statement of Reason (R).

Choose the correct answer out of the following choices.

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

93. Assertion (A): Both HCF and LCM of two natural numbers a & b can be
25 and 815 respectively.
Reason(R): LCM of two natural numbers is always divisible by their HCF.

94. Assertion (A): If three vertices of a parallelogram taken in order are
$(-1, -6), (2, -5)$ and $(7, 2)$, then its fourth vertex is (4,1).
Reason(R): Diagonals of a parallelogram bisect each other.

95. Assertion (A): If the total surface area and volume of a cube are numerically equal to
216, then the length of its edge is 6cm.
Reason(R): Volume and total surface area of a cube are always equal.

96. Assertion(A): D and E are points on the sides AB and AC respectively of a
$\triangle ABC$ such that AD = $(7x -4)$cm, AE=$(5x -2)$cm, DB =
$(3x +4)$cm and EC=$3x$ cm. If DE ∥ BC, then the value
of x is 5cm.
Reason(R): If a line divides any two sides of a triangle in the same ratio
then it is parallel to the third side.

Read the following paragraph and answer the questions : (97 to 100)

A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 metres) in height.
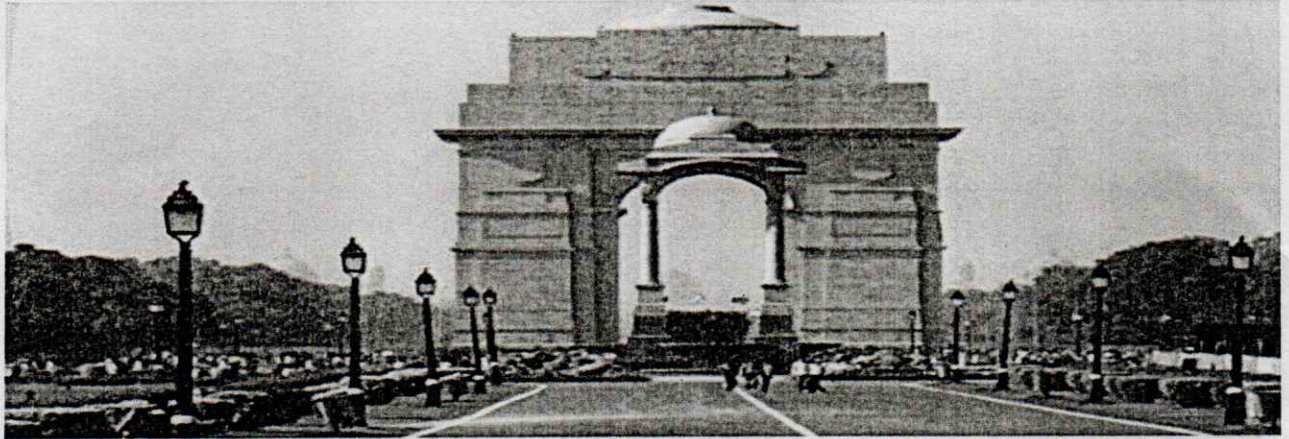
97. The angle of elevation if they are standing at a distance of 42m away from the monument is

   (a) 30°   (b) 45°   (c) 60°   (d) 0°

98. They want to see the tower at an angle of 60°. So, they want to know the distance where they should stand and hence find the distance.

   (Use $\sqrt{3} = 1.732$)

   (a) 25.24 m(approx.)

   (b) 20.12 m(approx.)

   (c) 42 m(approx.)

   (d) 24.25m(approx.)

99. If the altitude of the Sun is at 60°, then the height of the vertical tower that will cast a shadow of length 20 m is

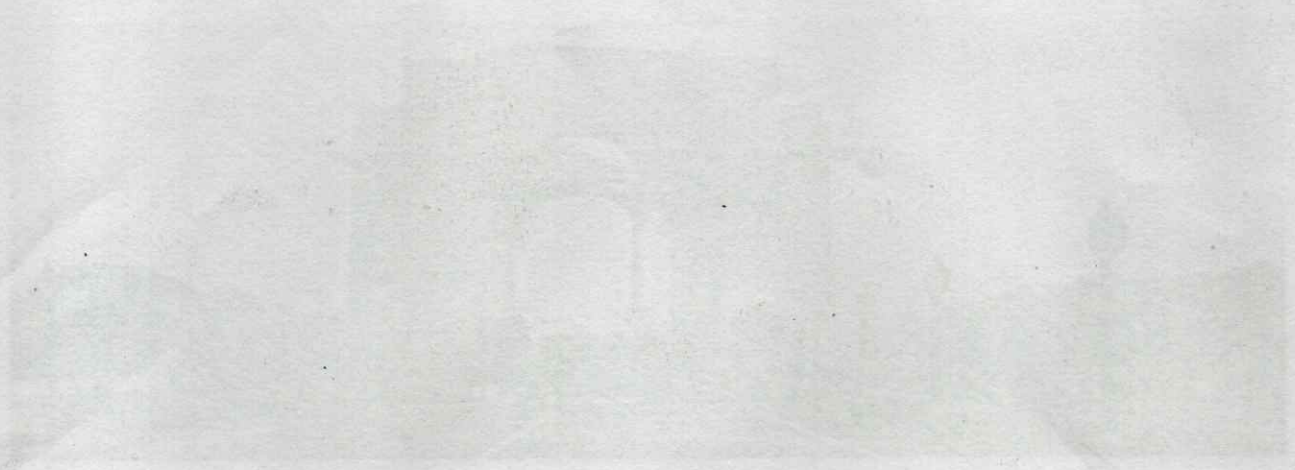   (a) $20\sqrt{3}$ m   (b) $20/\sqrt{3}$ m   (c) $15/\sqrt{3}$ m   (d) $15\sqrt{3}$ m

100. The ratio of the length its shadow and the tower is $1:\sqrt{3}$. The angle of elevation of the Sun is

   (a) 30°   (b) 45°   (c) 60°   (d) 90°

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Space for Rough Work