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

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 Δ 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≠CY (d) BC≠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 18^{th} 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) $k \neq -9$ (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: $Br\text{-}CH_2\text{-}CH_2\text{-}CHO$
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

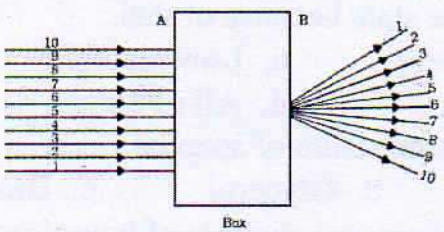
66. A compound X on strong heating in a boiling tube produces reddish brown fumes and a yellow residue. Further the compound X produces a white precipitate with NaOH solution. Identify X.
a. Copper nitrate c. Lead chloride
b. Lead nitrate d. Zinc sulphate

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 rating40 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

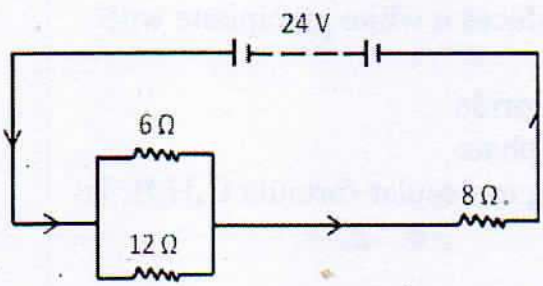
72. What is the minimum resistance which can be made using five resistors each of 5 Ω?

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?

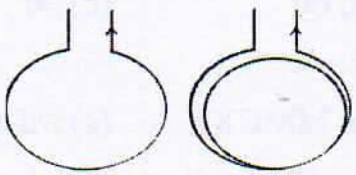
a. 2000V
b. 1500V
c. 1800V
d. 2200V

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



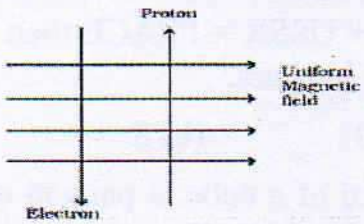
a. 5A
b. 1.65A
c. 1.3A
d. None of the above.

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

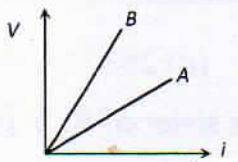
(a) ${}_a\mu_r = {}_a\mu_w \times {}_r\mu_\omega$ (b) ${}_a\mu_r \times {}_r\mu_w = {}_w\mu_a$

(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 Δ 2 = 6, 3 Δ 2 = 12 then 4 Δ 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

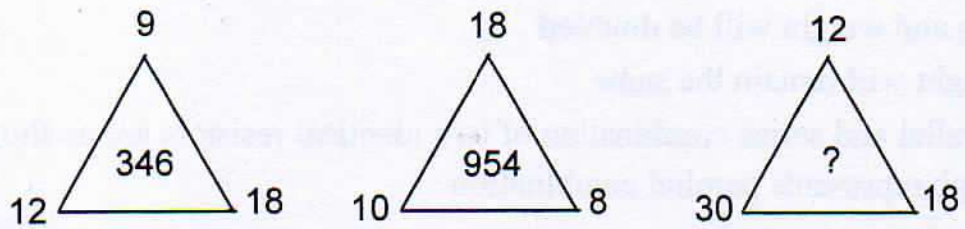
89.In a row of 30 children A is 15th from the left end and B is 20th from the right end. Then how many children in between them?

(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.



(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

***

Space for Rough