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.

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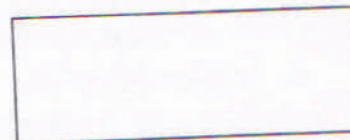
GENERAL SCIENCE

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
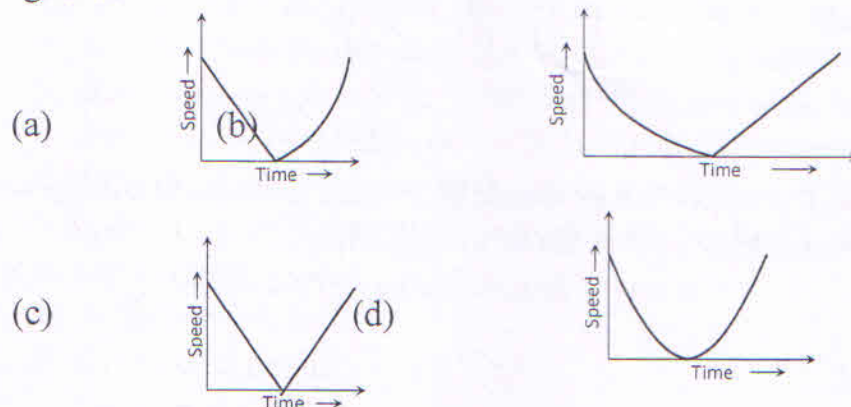
18. The resistivity of alloys $= R_{alloy}$; the resistivity of constituent metals R_{metal} . Then, usually
(a) $R_{alloy} = R_{metal}$
(b) $R_{alloy} < R_{metal}$
(c) There is no simple relation between R_{alloy} and R_{metal}
(d) $R_{alloy} > R_{metal}$

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.
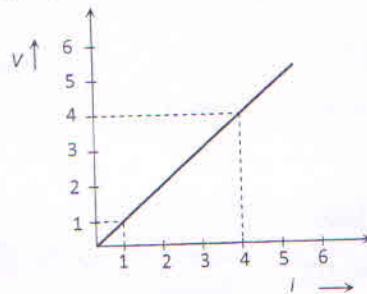
(a) $4\ ohm$ (b) $2\ ohm$
(c) $3\ ohm$ (d) $1\ ohm$

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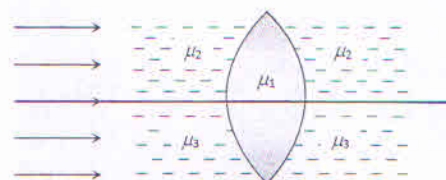
27. Which of the following is(are) exothermic process(es)?
   i.   Condensation of water vapour
   ii.   Dilution of sulphuric acid
   iii. Sublimation of dry ice
   iv.   Evaporation of water
       a. (i) and (iii)   b. (ii) only   c. (iii) and (iv)   d. (i) and (ii)

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
   b. 1.6×10^{-27} kg
   c. 1.6×10^{-24} gm
   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}
   b. 1.2044×10^{25}
   c. 12.044×10^{23}
   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
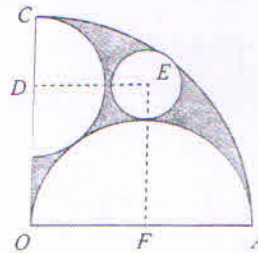

    a) $\frac{5}{2}\pi a^2$
    b) $\frac{1}{2}\pi a^2$
    c) $\frac{3}{2}\pi a^2$
    d) πa^2

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
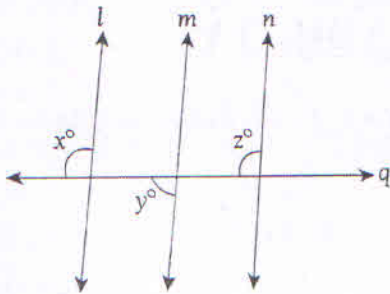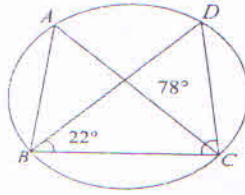

   a) $70°$
   b) $80°$
   c) $85°$
   d) $180°$

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 areThin.

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 isStamp.

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. SomeTerrorist 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 ofthe clock are inclined at 45°?

(a) 19 1/11minutes 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?

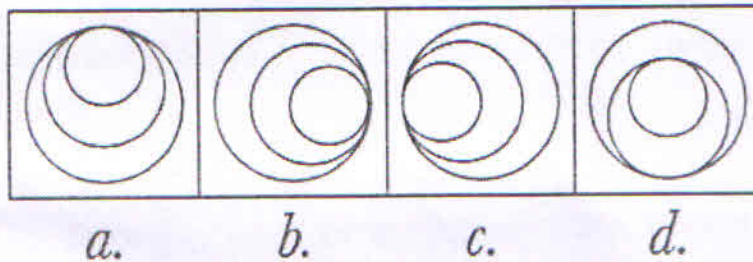(a) 2023   (b) 2022

(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