GENERAL INSTRUCTIONS

1. The question paper contains 125 questions, 25 each of 4 mark from Physics (1-25), Chemistry (26-50), Mathematics (51-75), Biology (76-100) and General Mental Ability (101-125).

2. The OMR sheet given in the examination hall is the Answer Sheet.

3. Calculators, log tables, slide rule, mobile or any other electronic gadgets in any form is not allowed.

4. Before answering the paper, fill up the required details in the blank spaces provided in the answer sheet.

5. Each Question carries 4 marks & 1 mark will be deducted for each wrong answer. So attempt each question carefully.

6. In case of any dispute, the answer filled in the OMR sheet available with the institute shall be final.
(Space for Rough work )
1. Image formed by a plane mirror is always _______.
   (a) real and erect    (b) virtual and erect    (c) real and inverted    (d) virtual and inverted

2. The centre of the sphere of which the spherical mirror forms a part is called ____________.
   (a) centre of curvature    (b) focus    (c) pole    (d) vertex

3. The focus of a convex mirror is ____________.
   (a) real    (b) virtual    (c) undefined    (d) at the pole

4. A converging mirror is known as ______________.
   (a) convex mirror    (b) plane mirror    (c) concave mirror    (d) cylindrical mirror

5. The relation between the focal length and radius of curvature of a mirror is ________.
   (a) \( R = f \)    (b) \( R + 2 = f \)    (c) \( f = R/2 \)    (d) \( f = 2R \)

6. Radius of curvature of a spherical mirror is always ________ to the mirror.
   (a) Parallel    (b) perpendicular    (c) inclined at 60°    (d) inclined at 45°

7. When a wave travels through a medium ________.
   (a) particles are transferred from one place to another
   (b) energy is transferred from one place to another
   (c) energy is transferred at a constant speed
   (d) none of the above statements is applicable

8. The minimum distance between the source and the reflector, so that an echo is heard is approximately equal to ________.
   (a) 10 m    (b) 17 m    (c) 34 m    (d) 50 m

9. Bats detect the obstacles in their path by receiving the reflected ________.
   (a) infrasonic waves    (b) radio waves    (c) electro-magnetic waves    (d) ultrasonic waves

10. When sound travels through air, the air particles ________.
    (a) vibrate along the direction of wave propagation
    (b) vibrate but not in any fixed direction
    (c) vibrate perpendicular to the direction of wave propagation
    (d) do not vibrate

11. The relation between wave velocity \( v \), frequency \( f \), and wavelength \( \lambda \) is ________.
    (a) \( f = v \times \lambda \)    (b) \( \lambda = f / v \)    (c) \( \lambda = v / f \)    (d) \( v = \lambda / f \)

12. The frequency of a wave travelling at a speed of 500 m/s is 25 Hz. Its wavelength will be ________.
    (a) 20 m    (b) 0.05 m    (c) 25 m    (d) 12500 m

13. The amplitude of a wave is ________.
    (a) the distance the wave moves in one second
    (b) the distance the wave moves in one time period of the wave
    (c) the maximum distance moved by the medium particles on either side of the mean position
    (d) the distance equal to one wave length

14. Which of the following is not a characteristic of a musical sound?
    (a) Pitch    (b) Wavelength    (c) Timbre    (d) Loudness
15. An image formed by a convex mirror is always ________.
   (a) virtual, erect and diminished  (c) virtual, erect and magnified
   (b) real, inverted and diminished  (d) real, erect and magnified

16. If the image formed by a concave mirror is virtual, erect and magnified, then the object is placed ________.
   (a) beyond the centre of curvature  (c) at the centre of curvature
   (b) at the focus  (d) between the pole of the mirror and the focus

17. An object is placed 1.5 m from a plane mirror. How far is the image from the person?
   (a) 3 m  (b) 1.5 m  (c) 2 m  (d) 1 m

18. Which of the following will remain unchanged when a sound wave travels in air or in water?
   (a) Amplitude  (b) Wavelength  (c) Frequency  (d) Speed

19. Sound and light waves both ________.
   (a) have similar wavelength  (c) obey the laws of reflection
   (b) travel as longitudinal waves  (d) travel through vacuum

20. An ultrasonic wave is sent from a ship towards the bottom of the sea. It is found that the time interval between the sending and receiving of the wave is 1.6 s. What is the depth of the sea, if the velocity of sound in the seawater is 1400 m/s?
   (a) 1120 m  (b) 560 m  (c) 1400 m  (d) 112 m

21. The distance between a compression and the next rarefaction of a longitudinal wave is ________.
   (a) \( \lambda /4 \)  (b) \( \lambda \)  (c) \( \lambda /2 \)  (d) \( 2\lambda \)

22. A plane mirror placed 2 m from an object is shifted by 0.5 m away from the object. What is the distance between the object and its image?
   (a) 2 m  (b) 1.5 m  (c) 5 m  (d) 3 m

23. An object of size 2.0 cm is placed perpendicular to the principal axis of a concave mirror. The distance of the object from the mirror equals to the radius of curvature. The size of the image will be ________.
   (a) 0.5 cm  (b) 1.5 cm  (c) 1.0 cm  (d) 2.0 cm

24. If an incident ray passes through the centre of curvature of a spherical mirror, the reflected ray will ________.
   (a) pass through the focus  (c) parallel to the principal axis
   (b) pass through the pole  (d) retrace its path

25. An object of size 2.0 cm is placed 50 cm away from a concave mirror. If the focal length is 20 cm, what is the nature of image formed?
   (a) Virtual, erect, magnified  (c) real, inverted, diminished
   (b) Virtual, inverted, magnified  (d) real, inverted, magnified

26. The valency of Helium is:
   (a) 10  (b) 0  (c) 9  (d) 11

27. The atomic number of H is:
   (a) 1  (b) 20  (c) 88  (d) 16
28. The element named after a planet is:
   (a) Silver (b) Neptunium (c) Curium (d) Gold

29. The formula of sodium chloride is:
   (a) SC (b) KCl (c) NaCl (d) NaC

30. The atomicity of oxygen in O₃ is:
   (a) 16 (b) 3 (c) 8 (d) 1

31. The isotope of hydrogen from among the following is:
   (a) Potassium (b) Oxygen (c) Carbon (d) Deuterium

32. The valency of sulphur in SO₃ is:
   (a) 6 (b) 10 (c) 7 (d) 22

33. Electrons are
   (a) positively charged (b) negatively charged (c) neutral (d) none of these

34. Rutherford studied the structure of atom with the help of:
   (a) Alpha particles (b) Gamma particles (c) Beta particles (d) Delta particles

35. Discovery of Neutrons was done by:
   (a) Albert Einstein (b) Isaac Newton (c) James Chadwick (d) Dr. A P J Abdul Kalam

36. Which of the following is NOT a sub atomic particle?
   (a) Proton (b) Neutron (c) Electron (d) Molecule

37. Dobereiner’s Triads consisted of groups of:
   (a) Three elements (b) Four elements (c) Six elements (d) Ten elements

38. “The chemical and physical properties of elements are a periodic function of their atomic numbers” is
   (a) The modern periodic law (b) Periodicity (c) The ancient periodic law (d) None of these

39. The Modern Periodic table has how many vertical groups?
   (a) 18 (b) 118 (c) 188 (d) 181

40. Which is the first element of the Modern Periodic Table?
41. The electronic configuration of Sodium (Atomic Number = 11, Mass Number = 23)?
   (a) 2,8,1  (b) 3,8  (c) 2,9  (d) 2,8,8,5

42. The oxidation number of Ca in CaO is
   (a) 1  (b) 2  (c) 3  (d) 4

43. Atomicity of Hydrogen in H₂ is:
   (a) 4  (b) 8  (c) 2  (d) 10

44. Which of the following elements forms anions (negatively charged ions)?
   (a) Sodium  (b) Potassium  (c) Fluorine  (d) Helium

45. At room temperature, most of the metals belong to which state of matter?
   (a) Solid  (b) Gas  (c) Plasma  (d) Bose-Einstein Condensate

46. Identify the correct statement:
   (a) Metals are generally gases at room temperature
   (b) Non-metals are poor conductors of heat and electricity
   (c) Metals gain electrons to form anions  (d) Sodium is a non metal

47. The first period only consists of 2 elements. It is also called as?
   (a) Shortest Period  (b) Long Period
   (c) Very Long Period  (d) Very Very Long Period

48. The maximum number of electrons present in the second shell is:
   (a) 0  (b) 8  (c) 80  (d) 30

49. The charge on a neutron is?
   (a) 0  (b) 1  (c) 2  (d) 3

50. What is the electronic configuration of Al³⁺?
   (a) 2  (b) 2,8  (c) 2,8,3  (d) None of these

51. The ratio of the number of boys and girls in a college is 7:8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?
   (a) 8:9  (b) 17:18  (c) 21:22  (d) cannot be determined
52. If a:b = 2:3 and b:c = 4:3, then find a:b:c
   (a) 8:12:9  (b) 2:3:8  (c) 2:3:9  (d) 2:3:12

53. Find the fourth proportion to 2,3,6.
   (a) 18  (b) 12  (c) 9  (d) 4

54. If A:B = 2:3, B:C = 4:5 and C:D = 6:7, then find the value of A:B:C:D
   (a) 15:24:30:35  (b) 16:24:30:35  (c) 17:24:30:35  (d) 18:24:30:35

55. If 2 : 9 :: x : 18, then find the value of x
   (a) 2  (b) 3  (c) 4  (d) 6

56. If x:y = 1:3, then find the value of (7x+3y):(2x+y)
   (a) 14:5  (b) 15:5  (c) 16:5  (d) 17:5

57. In a college, the ratio of the number of boys to girls is 8 : 5. If there are 200 girls, the total number of students in the college is
   (a) 420  (b) 520  (c) 620  (d) 720

58. If three numbers in the ratio 3 : 2: 5 be such that the sum of their squares is 1862, the middle number, when arranged in ascending order, will be:
   (a) 10  (b) 21  (c) 14  (d) 22

59. Salaries of Ravi and Sumit are in the ratio 2:3. If the salary of each is increased by Rs 4000, the new ratio becomes 40:57. What is Sumit's present salary.
   (a) 32000  (b) 34000  (c) 38000  (d) 40000

60. Factorize: 25-a^2-b^2-2ab
   (a) (25+a+b)(25-a-b)  (b) (5+a+b)(5-a-b)  (c) 5(a+b)^2  (d) none

61. The value of x in \( \frac{x+1}{2} + \left( x - \frac{x-1}{3} \right) = 2 \) is:
   (a) 1  (b) 2  (c) 3  (d) 0

62. If p=3x+1, q=\( \frac{1}{3}(9x+13) \) and p:q=6:5, then find x.
   (a) 7  (b) -7  (c) 3  (d) none of these
63. The digit in the ten’s place of a two digit no. is three times that in the one’s place. If the
digits are reversed, the new number will be 36 less than the original number. Find the number.
(a) 64 (b) 52 (c) 62 (d) 42

64. Denominator of a rational number is 4 less than its numerator. If 11 is added to the numerator and 1 is
subtracted from denominator the new number becomes \( \frac{7}{3} \). Find the rational number.
(a) \( \frac{23}{27} \) (b) \( \frac{27}{23} \) (c) \( \frac{13}{17} \) (d) \( \frac{17}{13} \)

65. The sum of two numbers is 2490. If 6.5% of one number is equal to 8.5% of the other, find the
numbers.
(a) 1411 & 1079 (b) 1410 & 1080 (c) 1490 & 1000 (d) 1390 & 1100

66. The sum of the present ages of father and his son is 60 years. 6 years ago, father’s age was five times
the age of his son. What is son’s present age :
(a) 8 (b) 14 (c) 12 (d) 10

67. The factors of \( \frac{x^2}{4} - \frac{y^2}{9} \) are:
(a) \( (\frac{x}{2} + \frac{y}{3})(\frac{x}{2} - \frac{y}{3}) \) (b) \( (\frac{x}{2} - \frac{y}{3})(\frac{x}{2} + \frac{y}{3}) \) (c) \( (\frac{x}{2} + \frac{y}{3})\frac{(x - y)}{3} \) (d) None of these

68. Ramu’s father is thrice old as Ramu. If father’s age is 45 years, then Ramu’s age is:
(a) 45 years (b) 30 years (c) 15 years (d) 10 years

69. If quotient = 3x^2 – 2x+ 1, remainder = 2x-5 and divisor = x+2, then the dividend is:
(a) 3x^3+4x^2-x-3 (b) 6x^3-19x^2+13x-3 (c) 3x^3-4x^2-x-3 (d) None of these

70. Solve: \( 3 - 2(2 - y) = 7 \)
(a) 8 (b) 4 (c) 2 (d) \( \frac{7}{2} \)

71. If \( 4x^4-3x^3-3x^2+x+7 \) is divided by 1-2x then remainder will be:
(a) 10 (b) 6 (c) 18 (d) 1

72. A quadratic polynomial is exactly divisible by(x+1) and (x+2) and leaves the remainder 4
after division by (x+3) then that polynomial is:
(a)x^2+6x+4 (b)2x^2+6x+4 (c)2x^2+6x-4 (d)x^2+6x-4
73. Solve the following equation:

\( \frac{1}{3} \left( \frac{3x}{2} + 4 \right) = \frac{1}{5}(x - 6). \)

(a) \( \frac{48}{13} \)  (b) \( -\frac{48}{13} \)  (c) \( -\frac{48}{5} \)  (d) \( \frac{48}{5} \)

74. If \((x - 2)\) is a factor of \(2x^3 - x^2 - px - 2\). Find the value of p.

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

75. For what value of \(a\), the polynomial \(g(x)\) is a factor of \(f(x)\)

\(f(x) = 2x^4 + 3x^3 + 2ax^2 + 3x + 6, \ g(x) = x + 2.\)

(a) -1  (b) 0  (c) 1  (d) 2

76. Which of the following is a cow breed?

(a) Jersey  (b) Mehsana  (c) Lucerne  (d) Aseel

77. Which is not a Rabi crop?

(a) Wheat  (b) Gram  (c) Pea  (d) Paddy

78. Unwanted and undesired plants growing in the field are called

(a) Crop  (b) Grass  (c) Pest  (d) Weeds

79. The ‘powerhouse’ of the cell is –

(a) Chloroplast  (b) Mitochondria  (c) Vacuole  (d) None of these

80. Who discovered Nucleus?

(a) Robert Hill  (b) Robert Brown  (c) Robert Hooke  (d) Captain Hook

81. The foldings of the inner membrane of mitochondria is called as –

(a) cisternae  (b) cristae  (c) granule  (d) folding

82. Foot and mouth disease occurs in

(a) Wheat  (b) Beetle  (c) Bull  (d) All of these

83. The crops which help in increasing the nitrogen content of the soil are called-

(a) Rabi  (b) Legumes  (c) Kharif  (d) Zayad

84. Which of the following is not modern mode of irrigation-

(a) Micro  (b) Sprinkle  (c) Chain pump  (d) Both a & b
85. Study of fungi is called as-
   (a) Mycology  (b) Cytology  (c) Microbiology  (d) None of these

86. Which statement is true?
   (a) Cataract is a contagious disease
   (b) SER is involved in fatty acids synthesis
   (c) Pathogens are friendly microbes.
   (d) Crop rotation helps in reducing soil fertility

87. The agricultural tool used to prepare the soil is -
   (a) Drill  (b) Harvester  (c) Combine  (d) Plough

88. 2,4-D is a type of -
   (a) Fertilizer  (b) Compost  (c) Weedicide  (d) All of these

89. Which is a chemical fertilizer- 
   (a) Urea  (b) Potash  (c) Compost  (d) Both a & b

90. Salmonellosis is caused by-
   (a) Virus  (b) Protozoa  (c) Bacteria  (d) All of these

91. What is the other name for Cattle plague?
   (a) Rinderpest  (b) Wanderlust  (c) Indian game  (d) Murrain

92. What is the cross breed of Tharparkar and Holstein-Friesian called-
   (a) Frieswal  (b) Karan-Fries  (c) RhodeIsland  (d) Holparkar

93. Which of the following is used as roughage for cattle-feed?
   (a) cowpea  (b) berseem  (c) silage  (d) All of these

94. What is the scientific name of the little bee?
   (a) Apis mellifera  (b) Apis dorsata  (c) Apis florea  (d) none of these

95. Which animal has been termed as ‘friend of farmer’?
   (a) Earthworm  (b) Tapeworm  (c) Leech  (d) All of these
96. Which is the correct order of agricultural steps?


(a) 3241    (b) 4321    (c) 2143    (d) 1234

97. In fallowing,

(a) Land is used for cultivating one crop after another
(b) Land is left uncultivated for a time period
(c) Weedicides are applied to the field
(d) Land is burned down to destroy previous crop remains

98. You are provided with a sample to check under microscope and your findings are- has the genetic material, has a cellular covering of protein, no advanced organelles nor has cell-wall. Based on these what can the organism be?

(a) insect cell, plant cell      (b) plant cell, bacterial cell
(c) bacterial cell or virus     (d) only virus

99. The approximate size of *Mycoplasma* is

(a) $10^{-8}$ m    (b) $10^{-7}$ m    (c) $10^{-6}$ m    (d) $10^{-5}$ μm

100. Mrigal is a type of -

(a) Surface feeder   (b) Column Feeder   (c) Bottom feeder   (d) Soil feeder

Directions: (101 to 120) Find the missing term in the following series.

101. 1, 4, 9, 16, 25, ?
(a) 35    (b) 49    (c) 36    (d) 64.

102. 22, 24, 28, ?, 52, 84
(a) 36    (b) 38    (c) 42    (d) 46

103. 1, 4, 5, 8, 9, ?
(a) 11    (b) 13    (c) 12    (d) 10

104 16, 19, 22, 25, ?
(a) 27    (b) 28    (c) 29    (d) 25

105 57, 54, 58, 55, 59, 56, 60, ?
(a) 64    (b) 63    (c) 58    (d) 57

106. 1, 3, 7, 15, 31, ?
(a) 61    (b) 63    (c) 65    (d) 67
107. 11, 15, 21, 29, ?
(a) 38  (b) 35  (c) 37  (d) 39

108. 2, 3, 5, 9, 17, 33, ….
(a) 65  (b) 37  (c) 63  (d) 64

109. 1, 1, 4, 8, 9, ?, 16, 64
(a) 21  (b) 27  (c) 25  (d) 28

110. 1, 10, 17, 22, 25, ?
(a) 26  (b) 25  (c) 27  (d) 29

111. HZF, IWH, KJL, NNJ, ?
(a) SHM  (b) RHN  (c) THN  (d) RGM

112. B2E, D5H, F12K, H27N, ?
(a) J58Q  (b) J56Q  (c) J57Q  (d) J56P

113. V, T, R, ?, N, ?
(a) P, M  (b) O, L  (c) P, L  (d) O, M

114. CAT, FDW, IGZ, ?
(a) KJA  (b) KTC  (c) LHD  (d) LJC

(a) D  (b) E  (c) F  (d) H

(a) A  (b) Y  (c) B  (d) Z

117. B-4, D-16, F-36, ?
(a) G-49  (b) H-64  (c) J-100  (d) H-81

118. FLP, INS, LPV, ?
(a) ORX  (b) PRY  (c) ORY  (d) OSY

119. 2B, 4C, 8E, 14H,
(a) 22L  (b) 24L  (c) 22K  (d) 22M

120. CIO, IOU, OUA, ?
(a) UAD  (b) UAG  (c) UAF  (d) UAE

121. If rains is called pink, pink in called cloud, cloud is called water, water is called breeze, and breeze is called moon, what do you wash your hands with ?
(a) Water  (b) Rain  (c) Breeze  (d) Moon

122. If air is called water, water is called green, green is called dust, dust is called yellow and yellow is called cloud, which of the following does fish live in ?
(a) Air  (b) Water  (c) Green  (d) Dust

123. If in a certain code ROAD is written as URDG, then how will SWAN be written in the same code ?
(a) VXDQ  (b) VZDQ  (c) VZCP  (d) UXDQ
124. If watch is called room, room is called bag, bag is called rain, rain is called air and air is called water, which is used to carry the books?
(a) room   (b) bag   (c) rain   (d) air

125. If in a certain code MANISH is written as NZMRHS, then how will RANJITA be written in the same code?
(a) IZMQRGZ   (b) IZMPRGZ   (c) IZMQRHZ   (d) IZMQRIZ