FIITJEE

Maharashtra Science Talent Search Examination

(only for Maharashtra State Students)

SAMPLE PAPER

Code	8002

Time: 180 minute (10:00 am - 01:00 pm)   **Maximum Marks: 270**

Please read the instructions carefully. Additional 30 minutes (09:30 am - 10:00 am) will be provided for Reading the Examination Instructions and filling up the information on the ORS Sheet.

INSTRUCTIONS

A: **General :**

1. Please Immediately fill in the particulars on this page of the Test Booklet with Blue/Black Ball point pen.
2. Blank papers, clipboards, log tables, slide rules, calculators, cellular phones, pagers and electronic gadgets in any form are not allowed.
3. The answer sheet, a machine-gradable Objective Response Sheet (ORS) is provided separately.
4. Do not Tamper/mutilate the **ORS** or this booklet.
5. No additional sheets will be provided for rough work.
6. On completion of this test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. *However, the candidates are allowed to take away this Test Booklet with them.*

B: **Questions paper format** & **Marking Schema:**

1. The question paper consists of **THREE** Parts:**PART I** (IQ), **II** (Science), **III** (Mathematics).
2. PART I contains **30** single choice correct type questions.Each question has four choices (A), (B), (C) and (D) of which one and only one is correct.
3. PART IIhas **THREE** Sections:
   a. SECTION **A** contains **13** single choice correct type questions in Physics.Each question has four choices (A), (B), (C) and (D) of which one and only one is correct.
   b. SECTION **B** contains **13** single choice correct type questions in Chemistry. Each question has four choices (A), (B), (C) and (D) of which one and only one is correct,and
   c. SECTION **C** contains **4** single choice correct type questions in Biology. Each question has four choices (A), (B), (C) and (D) of which one and only one is correct.
4. PART III contains 30 single choice correct type questions in Mathematics. Each question has four choices (A), (B), (C) and (D) of which one and only one is correct
5. **You are advised to devote 1 hour on PART I and 2 hours on PART II& III.**
6. For each question, in all three PARTs**,** you will be awarded **3 marks** if you darken the bubble corresponding to the correct answer **ONLY** and **zero (0) marks** if no bubbles are darkened. In all other cases, **minus one (−1) mark** will be awarded.

Registration No. : ☐☐☐☐☐ ☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

Name of Candidate : _____

Test Centre: _____

PART – I: IQ

SECTION A **Single Correct Choice Type**

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

Direction (Question No. 1 to Question 5) : Find the missing term in each of the following series.

1. 1, 9, 25, 49, ?, 121
    (A) 64
    (B) 81
    (C) 91
    (D) 100

2. 2, 5, 9, ? , 20, 27
    (A) 14
    (B) 16
    (C) 18
    (D) 24

3. 6, 12, 21, ?, 48
    (A) 33
    (B) 38
    (C) 40
    (D) 45

4. 3, 20, 63, 144, 275, ?
    (A) 354
    (B) 468
    (C) 548
    (D) 554

5. 8, 28, 116, 584, ?
    (A) 1752
    (B) 3502
    (C) 3504
    (D) 3508

Direction (Question No. 6 to 8) : Choose Relationship between two given words on one side of : : and one word is given on another side of : : Choose the correct alternative

6. Smoke : Pollution : War : ?
    (A) Destruction
    (B) Treaty
    (C) Victory
    (D) Peace

7. Milk : Emulsion : : Butter : ?
    (A) Aerosol
    (B) Suspension
    (C) Sol
    (D) Gel

8. Paw : Cat : : Hoof : ?
    (A) Horse
    (B) Lion
    (C) Lamb
    (D) Elephant

9. Which letter will be the eighth to the right of the third letter of the second half of the English alphabet?
    (A) V
    (B) W
    (C) X
    (D) Y

SPACE FOR ROUGH WORK

Direction (Question No. 10 to 12) : Study the number series given below and answer the questions that follow :
7 8 9 7 6 5 3 4 2 8 9 7 2 4 5 9 2 9 7 6 4 7

10. How many 7s are preceded by 9 and followed by 6?
    (A) 2   (B) 3
    (C) 4   (D) 5

11. Which figures have equal frequency?
    (A) 2, 5, 3   (B) 2, 4, 5
    (C) 3, 7, 5   (D) 8, 6, 5

12. Rohan ranks seventh from the top and twenty-sixth from the bottom in a class. How many students are there in the class?
    (A) 31   (B) 32
    (C) 33   (D) 34

13. If $\times$ Means - , + Means $\div$, - Means $\times$ and $\div$ Means +, then $15 - 2 \div 900 + 90 \times 100$ = ?
    (A) 190   (B) 180
    (C) 90   (D) None of these

14. Arrange the following items from general to particular :
    1. Animal
    2. Feline
    3. Leopard
    4. Mammal
    5. Vertebrate
    6. Cat
    (A) 1, 2, 3, 4, 5, 6   (B) 1, 3, 5, 4, 2, 6
    (C) 1, 4, 3, 2, 5, 6   (D) 1, 5, 4, 2, 3, 6

15. A shepherd had 17 sheep. All but nine died. How many was he left with?
    (A) Nil   (B) 8
    (C) 9   (D) 17

SPACE FOR ROUGH WORK

Direction (Question 16 to Question 17) Insert the missing character?

16.

A	D	H
F	I	M
?	N	R

(A) K (B) N
(C) O (D) P

17.

A	D	G
D	I	N
I	P	?

(A) V (B) W
(C) X (D) Y

18. If A + B > C + D and B + C > A + D then it is definite that
(A) D > B (B) C > D
(C) A > D (D) B > D

Direction (Question No. 19 to 23) : Each of these questions below contains three group of things. You are to choose from the following four lettered diagrams, the one that depicts the correct relationship among, the groups of things in each question.

(A)
(B)
(C)
(D)
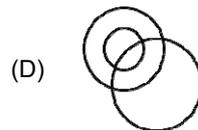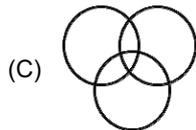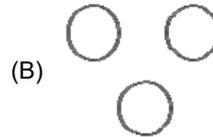
19. Tennis fans, Cricket players, Students

20. Flowers, Clothes, White

21. Smoker, Lawyers, Non-Smokers

22. Males, Fathers, Doctors

23. Fathers, Uncles, Directors

SPACE FOR ROUGH WORK

Direction (Question No. 24 to 27) : Read the following information carefully and answer the questions given below :
Six person A, B, C, D, E and F are sitting in two rows and facing towards North direction, three in each.
E is not at the end of any row.
D is second to the left of F.
C the neighbor of E is sitting diagonally opposite to D.
B is neighbor of F.

24. Which of the following are sitting diagonally opposite to each other?
(A) F and E (B) D and A
(C) C and B (D) A and F

25. Which of the following are in the same row?
(A) A and E (B) E and D
(C) C and B (D) A and B

26. Which of the following are in one of the two rows?
(A) FBC (B) CEB
(C) DBF (D) AEF

27. After interchanging seat with E, who will be the neighbours of D in the new position?
(A) C and A (B) F and B
(C) Only B (D) Only A

Direction (Question No. 28 to 30) The number group in each question below is to be codified according to following letter codes:

Number	5	1	3	0	2	4	8	7	6	9
Letter Code	X	L	M	P	D	B	E	F	K	J

You have to find out which of the answers a, b, c or d has the correct coded form of the given number of group.

28. 173846
    (A) LFMEKB   (B) LMFEBK
    (C) LFMEBK   (D) None of these

29. 862941
    (A) EDKJBL   (B) EKDJBL
    (C) EKJDBL   (D) EKDJBL

30. 430675
    (A) BMKPFX   (B) BMPKFX
    (C) BMPKXF   (D) BMPFKX

SPACE FOR ROUGH WORK

PART – II: Science

SECTION A PHYSICS

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

31. What is the maximum possible acceleration, that a train running on horizontal tracks can achieve? The coefficient of friction between track and wheels is 0.2. Acceleration due to gravity = 9.8 m/s^2.
(A) 9.8 m/s^2
(B) 4.9 m/s^2
(C) 1.96 m/s^2
(D) 49 m/s^2

32. Masses of two bodies are in ratio 1 : 2 and their velocities are also in the ratio 1 : 2. The ratio of their momentum is
(A) 1 : 2
(B) 2 : 1
(C) 1 : 4
(D) 4 : 1

33. A beaker containing some fluid is placed at rest. There are three points A, B and C in the shown in the fluid at same horizontal level. At which point is the pressure maximum?
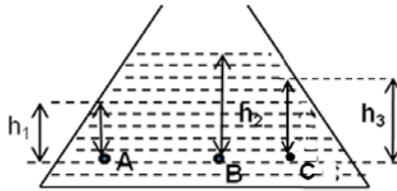
(A) A
(B) B
(C) C
(D) Same at all 3 points.

34. The pressure exerted by a liquid at the bottom of a tank of 5 m depth, completely filled with the liquid is 5 x 10^4 N/m^2. What is the density of the liquid? Given g = 10 m/s^2.
(A) 2500 kg/m^3
(B) 1 gm/cm^3
(C) 1000 gm/cm^3
(D) 2.5 kg/m^3

35. Which physical quantity has unit Kg wt?
(A) Mass
(B) Force
(C) Pressure
(D) Density

SPACE FOR ROUGH WORK

36. In which of the following cases, the body will have no acceleration?

(A)

10 N

10 N

(B)

10 N

10 N ← → 20 N

(C)

10 N

10 N

(D)

10 N   10 N
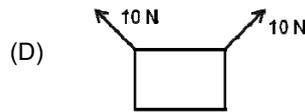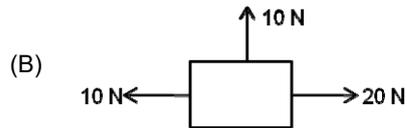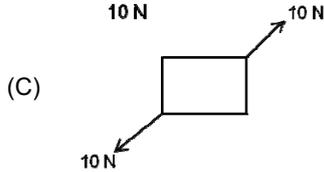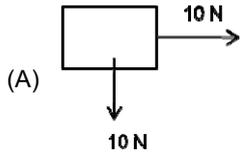
37. Which of the following forces is always attractive in nature?
(A) Magnetic force
(B) Gravitational force
(C) Electrostatic force
(D) None of these

38. What is the SI unit of relative density?
(A) gm/cm^3
(B) Kg/m^3
(C) Kg
(D) No unit.

39. What is the minimum frictional force required to keep the block stationary against the wall? (g = 10 m/s²)
(A) 10 N
(B) 20 N
(C) 5 N
(D) 50 N

$\mu = 0.5$

2 Kg ← F
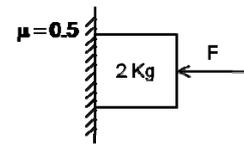
40. A force of 300 N is required to push a car of mass 500 kg slowly at constant speed on a level road. If a force of 500 N is applied, the acceleration of the car wall be :
(A) 0.2 m/s^2
(B) 0.4 m/s^2
(C) 0.6 m/s^2
(D) 0 m/s^2

41. A tank is filled with liquid of density 850 Kg/m³ upto a height of 6 m. What is the total pressure exerted on point P? (g=10 m/s², Atmospheric Pressure = 10^5 Pa)

6 m
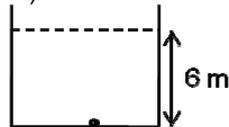
(A) 0.51×10^5 Pa
(B) 1.51×10^5 Pa
(C) 1×10^5 Pa
(D) 2.1×10^5 Pa

42. As we move at higher altitudes the air pressure
(A) Decreases
(B) Increases
(C) Remains same
(D) Can't say

43. A body has a mass of 4 kg and is moving with a velocity of 2 m/s. What is the momentum of the body?
(A) 2 Kg m/s
(B) 8 Kg m/s
(C) 16 Kg m/s
(D) 0.5 Kg m/s

SPACE FOR ROUGH WORK

| **SECTION B** | **CHEMISTRY** |

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

44. Which of the following is incorrect?
    (A) Metal oxides are basic
    (B) copper does react readily with water
    (C) Sodium is more reactive than magnesium
    (D) Phosphorous is kept in water to protect it from oxygen

45. Highest level of conductivity is expected by
    (A) Gold
    (B) Silver
    (C) Aluminium
    (D) None of these

46. Which of these is not a fossil fuel?
    (A) Coal
    (B) LPG
    (C) Bio gas
    (D) Natural Gas

47. The chemical added to LPG to help detect its leakage is
    (A) CH_3—CH—CH_3
                 |
                CH_3
    (B) C_2H_5-NH_2
    (C) CH_3SH
    (D) C_2H_5SH

48. An element A dissolves both in acid and alkali. It is an example of
    (A) Allotropic nature of A
    (B) Dimorphic nature of A
    (C) Amorphous nature of A
    (D) Amphoteric nature of A

49. When steam is passed over hot coke it produces?
    (A) Coal gas
    (B) Tear gas
    (C) Producer gas
    (D) Water gas

50. Which of the following is used as antiknock agent?
    (A) $Pb(C_2H_5)_4$
    (B) $PbCl_4$
    (C) $(CH_3COO)_2Pb$
    (D) C_2H_5OH

SPACE FOR ROUGH WORK

51. Which of the following alloys contains Tin?
    (A) Brass
    (B) Bronze
    (C) Steel
    (D) Duralumin

52. The gas used in burner in laboratory is
    (A) Coal gas
    (B) Oil gas
    (C) Water gas
    (D) Producer gas

53. The main constituent of LPG is
    (A) CH_4
    (B) C_2H_6
    (C) C_3H_8
    (D) C_4H_{10}

54. Charcoal does not produce a flame because
    (A) It is a mixture
    (B) It has high calorific value
    (C) It is a solid
    (D) It does not vapourise

55. An amalgam of metal has which other element?
    (A) C
    (B) Ag
    (C) Mg
    (D) Hg

56. Coal burns in presence of oxygen and produce gas X. Gas X used as a fire extinguisher and gas X turns lime water to milky precipitate 'Y'. Identify products X and Y.
    (A) Carbon dioxide, calcium hydroxide
    (B) Carbon dioxide, calcium carbonate
    (C) Carbon monoxide, calcium carbonate
    (D) Carbon dioxide, calcium sulphate

SPACE FOR ROUGH WORK

SECTION C	BIOLOGY

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

57. What happened when we inoculated Rhizobium in wheat field?
    (A) No increase in production (Nitrogen content in soil remains same)
    (B) A lot of increase in production. (Nitrogen content of soil increases)
    (C) fertility of soil decreases   (D) Fertility of soil increases

58. Which among the following processes absent in viruses?
    (A) Replication   (B) Mutation
    (C) Protein synthesis   (D) Energy production

59. Nucleic Acid occurs in
    (A) Golgi body & Endoplasmic reticulum   (B) Lysosome
    (C) Cytoplasm   (D) Mitochondria & Chloroplast

60. Cell is engaged in the synthesis of enzymes, which among the following cell organelles involved in the same process
    (A) Nucleus   (B) Chloroplast
    (C) Golgi body   (D) Rough Endoplasmic Reticulum

SPACE FOR ROUGH WORK

PART – III: Mathematics

| SECTION A | Single Correct Choice Type |

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

61. Which of the following is greatest?

$$-\frac{5}{7}, \frac{5}{-7}, \frac{-5}{-7}, -\frac{5}{7}$$

(A) $\dfrac{-5}{7}$ (B) $\dfrac{5}{-7}$

(C) $\dfrac{-5}{-7}$ (D) $-\dfrac{5}{7}$

62. If $\dfrac{x}{5} = -\dfrac{2}{3}$, then the value of x is

(A) $-\dfrac{2}{15}$ (B) $\dfrac{-10}{3}$

(C) $-\dfrac{15}{2}$ (D) $-\dfrac{3}{10}$

63. Cost of 1 litre of milk is Rs $25\dfrac{1}{4}$. The cost of 8 litre of milk is

(A) Rs 218 (B) Rs 200
(C) Rs 220 (D) Rs 202

64. The square root of $\dfrac{900}{1225}$ is

(A) $\dfrac{7}{6}$ (B) $\dfrac{6}{7}$

(C) $\dfrac{5}{7}$ (D) $\dfrac{5}{6}$

65. The value of 1 + 3 + 5 + 7 + …. + 41 is
(A) 441 (B) 499
(C) 361 (D) 400

SPACE FOR ROUGH WORK

66. To get a perfect square we should multiply 21168 by
    (A) 2   (B) 3
    (C) 5   (D) 7

67. $\sqrt[3]{0.027} + \sqrt[3]{0.064} - \sqrt[3]{0.001} = ?$
    (A) 0.4   (B) 0.5
    (C) 0.6   (D) 0.7

68. If $\sqrt[3]{79} = 4.291$, then cube root of 9875 is
    (A) 24.155   (B) 25.145
    (C) 21.455   (D) 24.515

69. 41503 becomes a pefect cube after multiplying by
    (A) 7   (B) 11
    (C) 13   (D) 17

70. The difference between square of two consecutive even numbers is 140. The numbers are
    (A) 28, 30   (B) 32, 34
    (C) 34, 36   (D) 36, 38

71. The value of x for which $\sqrt{3x + 1} = 4$ is
    (A) $\dfrac{\sqrt{3}}{2}$ (B) 5

    (C) 9   (D) 3

72. Lata's present age is four times her daughter's age. After 20 years, she will be twice her daughter's age. The present age of Lata is
    (A) 30 years   (B) 40 years
    (C) 45 years   (D) 50 years

SPACE FOR ROUGH WORK

73. If the cost price of 5 chairs is equal to the selling price of 6 chairs, find loss percent.

(A) $16\dfrac{1}{3}\%$　　　　　　　　　　　　　　　(B) $16\dfrac{2}{3}\%$

(C) $16\dfrac{1}{4}\%$　　　　　　　　　　　　　　　(D) $16\dfrac{3}{4}\%$

74. A man's salary was increased 5 times from x. His salary becomes 5 x. Find the percentage increase.
(A) 400%　　　　　　　　　　　　　　　(B) 500%
(C) 600%　　　　　　　　　　　　　　　(D) Cannot be determined

75. The value of a machine depreciates 40% annually. If its present value is 50000, what will be its value after one year?
(A) 40000　　　　　　　　　　　　　　　(B) 30000
(C) 20000　　　　　　　　　　　　　　　(D) 10000

76. At a clearance sale, all goods are sold at 35% discount. If I buy a pant marked at Rs 500, how much I would need to pay?
(A) Rs 315　　　　　　　　　　　　　　　(B) Rs 325
(C) Rs 335　　　　　　　　　　　　　　　(D) Rs 345

77. Find discount in percent when marked price is Rs. 825 and selling price is Rs 660.
(A) 15%　　　　　　　　　　　　　　　(B) 20%
(C) 25%　　　　　　　　　　　　　　　(D) 30%

78. Krisha's weight is 20% that of Mishka's weight and 50% that of Alka's weight, what percent of Mishka's weight is Alka's weight?
(A) 20%　　　　　　　　　　　　　　　(B) 30%
(C) 40%　　　　　　　　　　　　　　　(D) None of these

79. A toy was sold at a gain of 12%. Had it been sold for Rs 66 more, the gain would have been 16%. What is the cost price of toy?
(A) Rs. 1450　　　　　　　　　　　　　　　(B) Rs. 1500
(C) Rs. 1600　　　　　　　　　　　　　　　(D) Rs. 1650

SPACE FOR ROUGH WORK

80. A number is increased by 20% and then it is decreased by 20%. The net increase or decrease percent is
   (A) 2% increase
   (B) 2% decrease
   (C) 4% increase
   (D) 4% decrease

81. if 3x + 5y = 13 and xy = 3, the value of $9x^2 + 25y^2$ is _____
   (A) 59
   (B) 69
   (C) 79
   (D) None of these

82. The remainder, when $x^4 + x^2y^2 + y^4$ is divided by $x^2 + xy + y^2$, is equal to
   (A) 0
   (B) 1
   (C) - 1
   (D) y^2

83. The value of P in (x – 3)(x + 2) = x^2 + px – 6 is
   (A) 1
   (B) 0
   (C) - 1
   (D) None of these

84. The value of $a^3 + 27b^3$ if $a + 3b = 20$ and $ab = 7$ is
   (A) 7640
   (B) 4670
   (C) 6740
   (D) None of these

85. Length, Breadth and height of a cuboidal room are 5 m, 4 m and 3 m respectively, find the length of longest rod that can be kept inside the room
   (A) 5 m
   (B) $5\sqrt{2}$ m
   (C) 8 m
   (D) 10 m

86. Find value of a in $(x + 2)(x - a) = x^2 - 2x - 8$
   (A) 2
   (B) 4
   (C) - 2
   (D) - 4

87. If $x + \dfrac{1}{x} = 3$, find the values of $x^2 + \dfrac{1}{x^2}$ and $x^4 + \dfrac{1}{x^4}$
   (A) 7, 47
   (B) 6, 46
   (C) 5, 45
   (D) 5, 47

88. $(a + b + c)^2 - (a - b - c)^2$ equals
   (A) $2(ab + ac)$
   (B) $4(ab + ac)$
   (C) $2(ab + bc)$
   (D) $4(ab + bc)$

89. If $P = 1 - a$, then $p^3 + a^3 + 3ap =$ _____
   (A) 0
   (B) 1
   (C) - 1
   (D) None of these

90. If $a + b + c = 3$ and $ab + bc + ca = 3$, find $a^2 + b^2 + c^2$.
   (A) 1
   (B) 2
   (C) 3
   (D) None of these

SPACE FOR ROUGH WORK