

**NTSE FEBRUARY, 2021
STAGE -1 (A.P)**

**SCHOLASTIC APTITUDE TEST
SOLUTIONS**



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NTSE-FEBRUARY, 2021 (STAGE – 1 – AP) SCHOLASTIC APTITUDE TEST

QUESTION PAPER CODE: C

Time : 2 Hrs

Max.marks: 100

INSTRUCTIONS

Read the following instructions carefully before you answer the questions. Answers are to be SHADED on a SEPARATE OMR Answer Sheet given, with HB Pencil. Read the Instructions printed on the OMR Sheet carefully before answering the question.

1. Please write your Center Code Number and Roll Number very clearly (only one digit in one block) on the OMR Sheet as given in your admission card. Please see that no block is left unfilled and even zeros appearing in the Center Code Number are correctly transferred to the appropriate blocks on the OMR Sheet as shown in the example given in the OMR Sheet. For all the subsequent purpose your Center Code Number and Roll Number shall remain the same as given on the Admission Card.
2. Paper-II (Scholastic Aptitude test) consists of 100 questions (Q.Nos 1 to 100)
3. All questions carry one mark each.
4. Since all questions are compulsory do not try to read through the whole question paper before beginning to answer it.
5. Begin with the first question and keep trying one question after another till you finish all the questions
6. If you do not know the answer to any question, do not spend much time on it and pass on to next one. If time permits, you can come back to the questions which you have left in the first instance and try them again.
7. Since the time allotted to the question paper is very limited, you should make the best use of it by not spending too much time on any question.
8. A black page is provided for rough work at the end of question paper.
9. REMEMBER YOU HAVE TO SHADE ANSWERS ON A SEPARATE OMR SHEET PROVIDED.
10. Answer to each question is to be indicated by SHADING the circle having the number of the correct alternative in OMR Sheet from among the ones given for the corresponding question in the booklet.
11. Now turn to the next page and start answering the questions.
12. The OMR answer sheet consists of two copies, the ORIGINAL COPY and the CANDIDATE'S COPY. Do not separate or displace them. Do not darken the bubbles in two copies of OMR answer sheets separately. After the examination, you should hand over the OMR Sheet to the Invigilator of the room and can take away the candidate's copy of OMR answer sheet with them.
13. The candidate need not return this Question Paper booklet and can take it after completion of the examination. No candidate should leave the examination hall before the end of the examination.

PAPER - I
SCHOLASTIC APTITUDE TEST
(Q.Nos. 1 to 100)
Max. marks : 100

Note:

- (i) Subjects, Total questions of each subject and marks allotted:
- | | | | |
|----|-------------------|--------------|----------|
| 1) | Physics | 13 questions | 13 marks |
| 2) | Chemistry | 13 questions | 13 marks |
| 3) | Biology | 14 questions | 14 marks |
| 4) | Mathematics | 20 questions | 20 marks |
| 5) | History | 12 questions | 12 marks |
| 6) | Geography | 12 questions | 12 marks |
| 7) | Political Science | 08 questions | 08 marks |
| 8) | Economics | 08 questions | 08 marks |
- (ii) SHADE the correct alternatives in the OMR Answer Sheet provided, from amongst the ones given against the corresponding question in the Question Booklet. For shading the circles, use HB Pencil.

PHYSICS

1.2

Sol. As pressure increases boiling point increases

2.3

$$\text{Sol. } V_m = \frac{V_i + V_0}{2} \quad V_i = 10 \text{ cm/s}$$

3. 1

Sol. Volume of bottle = 2 cm³

Mass of oil = 1.76 g

Density = 0.88 g/cm³**OR**

$$\begin{aligned} R.D &= \frac{\text{density of oil}}{\text{density of water}} \\ &= \frac{(\text{mass of oil})/\text{volume}}{(\text{mass of water})/\text{volume}} \\ &= \frac{1.76}{2} = 0.88 \text{ g/cm}^3 \end{aligned}$$

4.2

$$\text{Sol. } KE = \frac{P^2}{2m} = \frac{3000 \times 3000}{2 \times 50} = 90,000 \text{ J}$$

5.2

$$\text{Sol. } Power = \frac{1}{\text{near point}} = \frac{1}{0.5} = 2D$$

6.1

Sol. Ice does not melt completely. Equilibrium temperature is 0⁰C

7.2

Sol. μ is more for kerosene than water, density of water is more than kerosene

8.3

Sol. (i), (ii) converging lens

(iii) diverging lens

9.2

Sol. Focal length is –ve, concave lens is used Myopia, near sightedness the ability to see close objects more clearly than distant objects.

10.2

$$\text{Sol. } a = \left(\frac{m_2 - m_1}{m_1 + m_2} \right) g$$
$$a = \left(\frac{12 - 8}{20} \right) g = g / 5$$

11.4

$$\text{Sol. } V = 72 \times \frac{5}{18} = 20 \text{ m/s}$$
$$F.S = \frac{1}{2} m (v^2 - u^2), F = 1000 \text{ N}$$

12.3

$$\text{Sol. } P = mV, \text{ Momentum doubled}$$

13.3

$$\text{Sol. } N = m(g + a)$$
$$= 75 \times 12 = 900 \text{ N}$$

CHEMISTRY

14.2

Sol. Pure substances cannot further be separated by physical methods

15.2

Sol. i) Curium – Cm

ii) Fermium – Fm

iii) Nobelium – No

iv) Mendelevium - Md

16.2

Sol. Gold was chosen for Rutherford's α -ray scattering experiment as it is one of the most malleable metals.

17. no answer available

Sol.
$$\frac{\text{rate}(H_2)}{\text{rate}(O_2)} = \sqrt{\frac{32}{2}} = \sqrt{\frac{16}{1}} = \frac{4}{1}$$

18. 3

Sol.
$$\begin{array}{ccc} C + O_2 & \rightarrow & CO_2 \\ \frac{12g}{4g} & & \frac{22.4l}{22.4 \times \frac{4}{12}} \end{array}$$

$= 7.46 \text{ lt}$

19. No answer available

Sol. $Na (Z = 11) : 1s^2 2s^2 2p^6 3s^1$

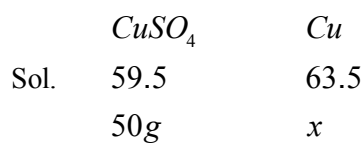
$Cu (Z = 29) : 1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

$Ge (Z = 32) : 1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^2$

20.2

Sol. Indicators are weak organic acids or bases used to detect the acidic/basic nature of solutions

21.1



$$x = 50 \times \frac{63.5}{161.5} = 19.90g$$

22.2

Sol. The melting point of silver is $961.8^{\circ}C$

23.1

Sol.

Colloid	Dispersed phase – Medium
i) Gemstone	C) Solid – solid
ii) Shaving cream	D) Gas – liquid
iii) Cheese	B) Liquid – solid
iv) Cloud	A) Liquid – gas

24.3

Sol. 6.023×10^{23} atoms of nitrogen weigh 14 g 3.023×10^{23} atoms of nitrogen weighs 7 g

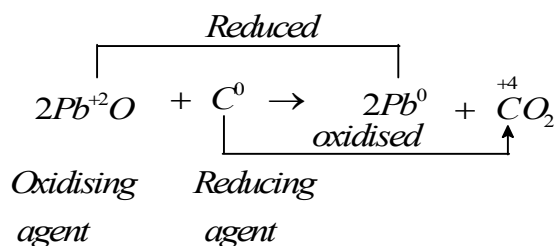
25.2

Sol. Electronic configuration of potassium : $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

$$n = 4, l = 0, m_l = 0, m_s = +\frac{1}{2} \text{ (or } -\frac{1}{2})$$

26.4

Sol.



BIOLOGY

27.1

28.3

29.4

30.2

31.4

32.2

33.1

34.2

35.3

36.4

37.2

38.4

39.4

40.4

MATHEMATICS

41. 2

$$\text{Sol: } x\left(\frac{11}{10}\right)^n = y\left(\frac{11}{10}\right)^{n-1} = 3\left(\frac{11}{10}\right)^{n-2}$$

$$x\frac{121}{100} = y\frac{11}{10} = 3$$

$$\frac{x}{100} = \frac{y}{110} = \frac{3}{121}$$

42. 4

Sol: (i) is wrong as angles must be equal in equilateral triangle

$$(ii) a \times b = 21, a - b = 4 \text{ then } a + b = \sqrt{16 + 4(21)} = \sqrt{16 + 84} = \sqrt{100}$$

$$a + b = 10$$

$$\therefore a = 7, b = 3$$

(iii) distance between them is 5 units.

(iv) $2 \cdot \cos^2 \theta = 3 - 3 \sin \theta$, $\theta = 30^\circ$ satisfies.

43. 3

$$\text{Sol: } \sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 90^\circ$$

$$= \sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 40^\circ + \sin^2 45^\circ + \sin^2 90^\circ$$

$$+ \cos^2 40^\circ + \cos^2 35^\circ + \dots + \cos^2 5^\circ$$

$$= 8 + \frac{1}{2} + 1 = \frac{19}{2}$$

44. 4

$$\text{Sol: } CSA = 2\pi r \times h = 4\pi\alpha^2 + 4\pi\alpha - 3\pi$$

$$\Rightarrow 2rh = 4\alpha^2 + 4\alpha - 3 = 4\alpha^2 + 5\alpha - 2\alpha - 3 = 2\alpha(2\alpha + 3) - (2\alpha + 3)$$

$$2rh = (2\alpha - 1)(2\alpha + 3)$$

$$r = \frac{1}{2}, h = 4\alpha^2 + 4\alpha - 3$$

45. 1

$$\text{Sol: } x = \frac{28+34+41+23+45+18+21}{7} = \frac{210}{7} = 30$$

$$2 - \log_x^2 - \log_x^3 - \log_x^5 = 2 - \log_x(30)$$

$$\Rightarrow 2 - \log_{30}^{30} = 2 - 1 = 1$$

46. 2

47. 3

$$\text{Sol: } \frac{x+y+3}{3} = y \Rightarrow x+3 = 2y$$

48. 2

$$\text{Sol: } \alpha^{39} + \alpha^{21} - \alpha^{27} - \alpha^9 + 1$$

$$\alpha^{27}(a^{12} - 1) + a^9(a^{12} - 1) + 1$$

$$(a^{12} - 1)(a^{27} + a^9) + 1$$

$$\alpha^2 + 1 = \sqrt{3}\alpha$$

$$\alpha^4 + 2\alpha^2 + 1 = 3\alpha^2$$

$$\alpha^4 - \alpha^2 + 1 = 0$$

$$\alpha^4 = \alpha^2 - 1$$

$$\alpha^8 = \alpha^4 + 1 - 2\alpha^2$$

$$\alpha^6 = -1$$

$$\Rightarrow \alpha^{39} + \alpha^{21} - \alpha^{27} - \alpha^9 + 1 = 1$$

49. 4

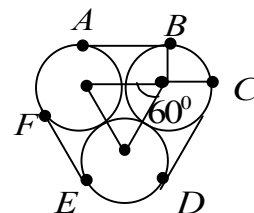
$$\text{Sol: } AB = CD = EF = 2\sqrt{r_1 r_2} = 2\sqrt{\left(\frac{7}{2}\right)^2} = 7$$

$$\angle B \times C = 360^\circ - (90^\circ + 90^\circ + 60^\circ) = 120^\circ$$

$$BC = \frac{120^\circ}{360^\circ} \times 2\pi r$$

$$\Rightarrow \frac{1}{3} \left(2\pi \times \frac{7}{2} \right) = \frac{7\pi}{3}$$

$$\therefore \text{Length of belt} = 3 \times 7 + 3 \times \frac{7\pi}{3} = 21 + 7 \times \frac{22}{7} = 43$$



50. 2

Sol:

$$15^2 + 256 + x^2 = (16 + \sqrt{225 - x^2})^2$$

$$225 + 256 + x^2 = 256 + 225 - x^2 + 32\sqrt{225 - x^2}$$

$$2x^2 = 32(\sqrt{225 - x^2})$$

$$\frac{x^4}{256} = 225 - x^2$$

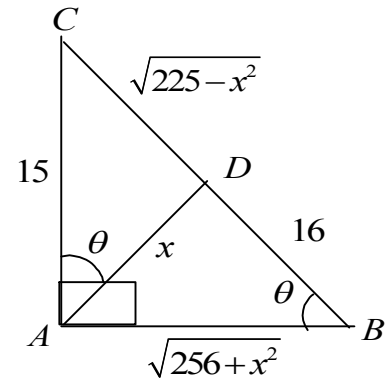
$$x^4 + 256x^2 - 225 \times 256 = 0$$

$$x^2 = \frac{-256 + \sqrt{(256^2) + 4 \cdot 15^2 \cdot 16^2}}{2 \cdot 1}$$

$$x^2 = 144$$

$$x = 12$$

$$\text{Area} = \frac{1}{2} \times 15 \times 20 = 150$$

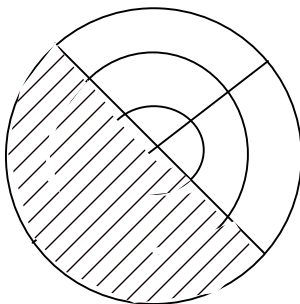


51. 3

$$\text{Sol: } \frac{25 + 49 + 64 + 100 + 121 + 169}{3} = 176$$

52. 2

Sol: Since all angles are equal the required region is $\text{Area} = \frac{1}{2} \pi e^2$



53. 3

Sol: Only circles = points

Only lines = 1 points

Circle and line = $2 \times 2 \times 3 = 12$ points

54. 3

$$\text{Sol: } 4^{1/3} \cdot 8^{1/4} = 2^{2/3} \cdot 2^{3/4} = 2^{2/3+3/4} = 2^{17/12} = 2 \cdot 2^{5/12} = 2 \cdot (32)^{1/12}$$

55. 2

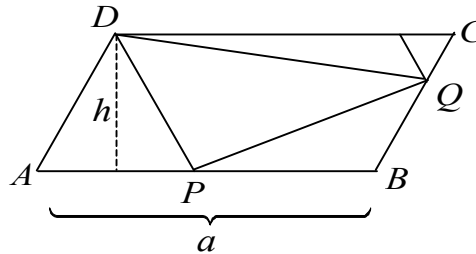
Sol: ABCD area = a.h

$$\Delta ADP = \frac{1}{2} \cdot \frac{a}{2} \cdot h$$

$$\Delta DCQ = \frac{1}{2} \cdot a \cdot \frac{h}{2}$$

$$\Delta BPQ = \frac{1}{4} \Delta ABC = \frac{1}{8} \cdot \square ABCD = \frac{1}{8} ah$$

$$\Delta DPQ = ah - \frac{1}{4} ah - \frac{1}{4} ah - \frac{1}{8} ah = \frac{3}{8} ah$$



56. 3

$$\text{Sol: } x^2 - 5x + 3 = 0$$

$$\Rightarrow x(x-5) + 3 = 0$$

$$\Rightarrow x - x = \frac{3}{x}$$

$$\Rightarrow x^2 + 3 = 5x$$

$$\frac{x^2 \left(\frac{3}{x} \right)}{5x + x} + \frac{5x + x}{x^2 \left(\frac{3}{x} \right)} = \frac{5}{2}$$

57. 2

Sol: Let m boys and n girls.

$$\frac{m \times 16.4 + n \times 15.4}{m + n} = 15.8$$

$$16.4m + 15.4n = 15.8m + 15.8n$$

$$16.4m + 15.4n = 15.8m + 15.8n$$

$$0.6m = 0.4n$$

$$\frac{m}{n} = \frac{2}{3}$$

58. 2

$$\text{Sol: } x = a(2x + y + z)$$

$$y = a(x + 2y + 2)$$

$$z = a(x + y + 2z)$$

$$x + y + z = a(4x + 4y + 4z)$$

$$\Rightarrow a = 4$$

59. 2

$$\text{Sol: } \frac{8-K}{K-2} = \frac{1+4}{-4+5} \Rightarrow K = 3$$

60. 4

Sol: (i) Numbers divisible by 5 : 15, 20,, 60 = 10 numbers

$$\text{Total numbers} = 60 - 12 = 48$$

$$\text{Probability} = \frac{10}{48} = \frac{5}{24}$$

(ii) Primes: 13, 17, 19, 23, 29, 31, 37, 41, 47, 53, 59

$$\text{Total} = 12$$

$$P = \frac{12}{48} = \frac{1}{4}$$

(iii) Multiples of 19 = 19, 38, 57

$$P = 1 - \text{Probability of prime} = 1 - \frac{1}{4} = \frac{3}{4} = \frac{36}{48}$$

HISTORY

61.3

62.3

63.1

64.1

65.3

66.3

67.1

68.1

69.3

70.2

71.2

72.1

GEOGRAPHY

73.4

74.1

75.4

76.2

77.4

78.3

79.3

80.3

81.1

82.4

83.3

84.1

POLITICAL SCIENCE

85.2

86.3

87.3

88.2

89.4

90.1

91.3

92.1

ECONOMICS

93.4

94.3

95.2

96.2

97.1

98.4

99.3

100.1