MAHARASHTRA

NATIONAL TALENT SEARCH EXAMINATION,2017-18

SAT ANSWER KEY

QUE.	1	2	3	4	5	6	7	8	9	10
ANS.	4	2	3	1	2	1	3	4	4	1
QUE.	11	12	13	14	15	16	17	18	19	20
ANS.	3	2	1	3	4	3	2	4	1	2
QUE.	21	22	23	24	25	26	27	28	29	30
ANS.	1	2	2	1	1	2	4	4	1	2
QUE.	31	32	33	34	35	36	37	38	39	40
ANS.	3	4	2	2	1	4	2	3	2	4
QUE.	41	42	43	44	45	46	47	48	49	50
ANS.	2	4	2	3	1	4	3	2	1	4
QUE.	51	52	53	54	55	56	57	58	59	60
ANS.	2	3	4	4	3	4	1	3	2	2
QUE.	61	62	63	64	65	66	67	68	69	70
ANS.	1	3	3	3	1	4	1	2	2	4
QUE.	71	72	73	74	75	76	77	78	79	80
ANS.	1	3	1	3	2	1	3	2	2	4
QUE.	81	82	83	84	85	86	87	88	89	90
ANS.	3	1	1	3	1	1	1	3	2	4
QUE.	91	92	93	94	95	96	97	98	99	100
ANS.	2	1	3	1	4	4	1	3	3	3

SAT SOLUTIONS

1. (4)
Theory :- Light bonds due to difference in R.I. of air layers.

2. (2)
General Knowledge

3. (3)
Theory:- Universal law of gravitation

4. (1)

$$P = \frac{F}{A} = \frac{50}{0.5 \times 10^{-6}}\ N/m^2 = 100 \times 10^6\ N/m^2$$

5. (2)
Theory:- Property of human eye

6. (1)
Theory

7. (3)
Theory

8. (4)
Theory:- Filed lines originate from north pole and end on south pole outside magnet

9. **(**4)
Theory:- Phenomenon is reflection

10. (1)
Theory:- Electromagnetic Induction

11. (3)
$Q = it = 0.4 \times 3 \times 60 = 72C$

12. (2)
Theory:- Image formation by concave mirror

13. (1)
Theory:- Circuit diagram for Ohm's Law

14. (3)
Ionisation energy decreases down the group and increases across the period. Hence K

15. (4)

$K^+ = 19 - 1 = 18$

$Cl^- = 17 + 1 = 18$

$Ca^{2+} = 20 - 2 = 18$

Hence Only K

16. (3)

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

17. (2)

$$\underset{\text{Blue}}{CuSO_4 \cdot 5H_2O} \rightarrow \underset{\text{white anhydrous } CuSO_4}{CuSO_4}$$

18. (4)
Ant sting contains methanoic acid also called formic acid.

19. (1)
Na_2CO_3 is formed from NaOH and H_2CO_3 i.e. strong base and weak acid.
Hence Na_2CO_3.

20. (2)
HCl . Rest all are ionic

21. (1)
Copper lies below H in reactivity series.

22. (2)
CH_3COOH and C_2H_5COOH
a difference of $-CH_2$

23. (2)

$CH_3 - CH = CH_2$

24. (1)
Stainless steel is a mixture of Iron, Nickel, Chromium and Carbon.

25. (1)
Nonmetals form acidic oxides.
Hence aromic No. 7

26. (2)
C_nH_{2n+1} is alkyl

27. (4)
CO_2 and water (CO_2 is reduced to $C_6H_{12}O_6$ and H_2O is oxidized to oxygen)

28. (4)
Testis (Is male reproductive organ while others are female)

29. (1)
50 decibel (in day time, 40 decibel at night in silent zone)

30. (2)
114 (N_2O remains in the atmosphere for 114 years)

31. (3)
Two (Deoxydenated blood enters the heart and then lungs, oxygenated blood enters the heart and pumped to other parts of the body (Pulmonary circulation and then systemic circulation))

32. (4)
Seisononastic movement (Nastic movement, nondirectional movement towards direction of touch)

33. (2)
Regeneration is not truly a reproductive process, rather it's a process of renewal, restoration and growth in organisms.

34. (2)
23 pairs of chromosomes (22 pairs of autosome and one pair of allosome)

35. (1)
Darwin explained natural selection, Lamarck explained inheritance of acquired characters and Mendel is known for pioneering work in inheritance.

36. (4)
1, 2 and 3 belongs to Thallophyta and 4 belongs to Bryophyta

37. (2)
Raphide crystals are sharp needle like crystals of calcium oxalate that dart and cause discomfort to throat, activates inflammatory reaction by production of histamines.

38. (3)
Area A is for perception of touch, pain etc.
Area B is for perception of sound
Area C is occipital lobe of for brain for visual perception
Area D is for thinking, Intelligence etc.

39. (2)
Estrogen is secreted by ovary

40. (4)
1, 2 and 3 are pteridophytes and 4 is bryophyte

41. (2)

42. (4)

43. (2)

44. (3)

45. (1)

46. (4)

47. (3)

48. (2)

49. (1)

***50.** **(4)** (Correction in question - League of nation)

51. (2)

52. (3)

53. (4)

54. (4)

55. (3)

56. (4)

57. (1)

58. (3)

59. (2)

60. (2)

61. (1)

62. (3)

63. (3)

64. (3)

65. (1)

66. (4)

67. (1)

68. (2)

69. (2)

70. (4)

71. (1)

72. (3)

73. (1)

74. (3)

75. (2)

76. (1)

77. (3)

78. (2)

79. (2)

80. (4)

81. (3)

11, 15, 19, . . . 299
299 = 11 + (n – 1)4
$\therefore$ n = 73

82. (1)

$x^2 + 2\sqrt{x} - 6 = 0$

$\Rightarrow x^2 + 3\sqrt{2}x - \sqrt{2}x - 6 = 0$

$\Rightarrow (x - \sqrt{2})(x + 3\sqrt{2}) = 0$

$x = \sqrt{2}, -3\sqrt{2}$

83. (1)

$50 \rightarrow$ 10,000/-
$100 \rightarrow$ 20,000/-

84. (3)

Speed x km/hr distance = y km
Speed = (x + 15)

$\frac{y}{x+15} = \frac{y}{x} - 2$

$\Rightarrow xy = (x + 15)(y - 2x)$

$\Rightarrow xy = xy + 15y - 2x^2 - 30x$

$\Rightarrow 15y = 2x^2 + 30x$

Speed = (x – 15) km/hr

$\frac{y}{x-5} = \frac{y}{x} + 1$

$xy = (x - 5)(y + x)$

$\Rightarrow xy = xy + x^2 - 5y - 5x$

$\Rightarrow 5y = x^2 - 5x$

$\Rightarrow 15y = 3x^2 - 15x$

$\therefore 3x^2 - 15x = 2x^2 + 30x$

$\Rightarrow x^2 - 45x = 0$

x = 0, x = 45

$\therefore$ y = $\frac{(45)^2}{5} - 45$ = 405 – 45 = 360 km

85. (1)

$(\sqrt[3]{3} + \sqrt[3]{2})(\sqrt[3]{9} + \sqrt[3]{4} - \sqrt[3]{6})$

$= \sqrt[3]{27} + \sqrt[3]{12} - \sqrt[3]{18} + \sqrt[3]{18} + \sqrt[3]{8} - \sqrt[3]{12}$

= 3 + 2 = 5

86. (1)

$x + 12 = 160 \times \frac{1}{x}$

$\Rightarrow x^2 + 12x = 160$

$\Rightarrow x^2 + 12x - 160 = 0$

$\Rightarrow x^2 + 20x - 8x - 160 = 0$

$\Rightarrow x(x + 20) - 8(x + 20) = 0$

X = 8, x = -20
X = 8
$\therefore$ Number = 8 + 12 = 20

87. (1)

n(S) = 50
E = {2, 3, 5, 7, 11, 13, 17, 19, 23, 2, 31, 37, 41, 43, 47}
n(E) = 15

$\therefore$ P(E) = $\frac{15}{50} = \frac{3}{10}$

88. (3)

$52 = (4)3 + 2(4)2 - 4\alpha - 12$

$\Rightarrow 52 = 64 + 32 - 4\alpha - 12$

$\Rightarrow 4\alpha = 84 - 52$

$\Rightarrow \alpha = \frac{32}{4} = 8$

89. (2)

$D_x = \begin{vmatrix} 7 & m \\ 5 & 8 \end{vmatrix} = 56 - 5m$

$x = \frac{D_x}{D}$

$\Rightarrow 9 = \frac{56 - 5m}{4}$

$\Rightarrow 36 = 56 - 5m$

$\therefore = \frac{20}{5} = 4$

90. (4)

0 – 10	30
10 – 20	42
20 – 30	50
30 – 40	80 → Modal class
40 – 50	50
50 – 60	40

$l = 30$

$n = 10$

$f_1 = 80$

$f_0 = 50$

$f_2 = 50$

$\therefore$ Mode $= \ell + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

$= 30 + \left(\frac{80 - 50}{160 - 50 - 50}\right) \times 10$

$= 30 + \frac{30}{60} \times 10 = 35$

91. (2)

$\frac{\cos^2 30^\circ + \cos 30^\circ \cdot \sin 30^\circ + \sin^2 30^\circ}{\cos^3 30^\circ - \sin^3 30^\circ}$

$= \frac{(1 + \sin 30^\circ \cdot \cos 30^\circ)}{(1 + \sin 30^\circ \cos 30^\circ)}$

$= \frac{1}{\frac{\sqrt{3}}{2} - \frac{1}{2}} = \frac{2}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1}$

$= \sqrt{3} + 1$

92. (1)

$\tan\theta = -1$

$\frac{\sec\theta + \operatorname{cosec}\theta}{\cos\theta - \sec\theta} = \frac{\operatorname{cosec}\theta(\tan\theta + 1)}{\cos\theta(1 - \tan\theta)} = 0$

93. (3)

Equation of PQ

$y = \frac{1}{2}x + 3$

$y - \frac{x}{2} = 3$

$\frac{y}{3} + \frac{x}{(-6)} = 1$

Intercept on x is -6.

94. (1)

$$\frac{\frac{4}{3}\pi r^3}{4\pi r^2} = \frac{\sqrt{7}}{3}$$

95. (4)

$N \times \pi \times 1.1 \times 1.1 \times 0.2 = \pi \times 3.3 \times 3.3 \times 40$

$N = 1800$

96. (4)

$$\frac{[PMD]}{[RND]} = \frac{1}{4} = \left(\frac{1}{2}\right)^2$$

$$\frac{PM}{RN} = \frac{1}{2}, \frac{[PQS]}{[RQS]} = \frac{\frac{1}{2} \times QS \times PM}{\frac{1}{2} \times QS \times RN} = \frac{1}{2}$$

97. (1)

$$S = 15 + \frac{x}{2}$$

$$80 = \sqrt{\left(15 + \frac{x}{2}\right)\left(\frac{x}{2} + 5\right)\left(15 - \frac{x}{2}\right)\left(\frac{x}{2} - 5\right)}$$

$$x = 2\sqrt{65}$$

98. (3)

Let $\angle BAC = \angle BCA = y$

Then $\angle OAB = \angle ABO = 2y$

$4y = x$

$x/y = 4$

99. (3)

$\Delta OCD \sim \Delta OAB$

$$\frac{[OCD]}{[OAB]} = \frac{40^2}{16^2} = \frac{25}{4}$$

100. (3)

$$\frac{1}{2}[PQCB] = [PSB]$$

$$\frac{1}{2} \times 8 \times 12 = [PSB]$$

$$[PSB] = 48$$