

# FIITJEE

## MAHARASHTRA

### NATIONAL TALENT SEARCH EXAMINATION, 2020-21

#### STAGE – 01

#### SCHOLASTIC APTITUDE TEST (SAT) SOLUTIONS

#### SAT

1. (1) Gravitation force will provide the necessary centripetal force  
(2) Tension force will provide the centripetal force  
(3) Nuclear force will provide the centripetal force  
(4) Electromagnetic force will provide the centripetal force

2. 3

3. 1

$$M_p = 25M_e, R_p = 125R_e, \frac{V_p}{V_e} = ?$$

$$V_e = \sqrt{2g_e R_e}, V_p = \sqrt{2g_p R_p} \Rightarrow V_p = \sqrt{\frac{2GM_p}{R_p^2} \times R_p}$$

$$V_p = \sqrt{\frac{2G \times 25M_e}{(125R_e)^2} \times R_p} \Rightarrow V_p = \sqrt{\frac{50GM_e}{125 \times 125} \times \frac{R_p}{R_e^2}}$$

$$V_p = \sqrt{\frac{2}{5 \times 125} g_e R_p}$$

$$\text{Now, } \frac{V_p}{V_e} = \sqrt{\frac{\frac{2}{5 \times 125} g_e R_p}{2g_e R_e}} \Rightarrow \frac{V_p}{V_e} = \frac{1}{\sqrt{5}}$$

4. 3

$$H = mc\Delta T \Rightarrow H = mc(T_2 - T_1) \Rightarrow \frac{H}{mc} = (T_2 - T_1)$$

$$T_2 = T_1 + \frac{H}{mc}$$

So  $T_2$  be high for small 'c'

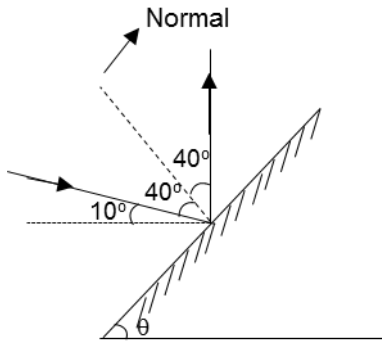
5. 2

$$V_s = \frac{V}{1.8}, \text{ where } V_s \text{ is speed of light in sapphire and } V \text{ is speed of light in vacuum}$$

$$\% \text{ of decrease} = \left[ \frac{V_s - V_f}{V} \times 100 \right] \Rightarrow \left( \frac{\frac{V}{1.8} - V}{V} \right) \times 100$$

Approximately 45%

6. 2



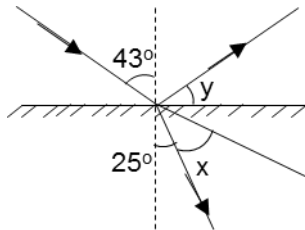
By Geometry  
 $\theta = 40^\circ$

7. 1  
 By using  $\mu \sin i = \text{constant}$ , we can say that  
 $\mu_1 > \mu_2, \mu_3 > \mu_2, \mu_3 = \mu_4, \mu_5 < \mu_4$

8. 3  
 9. Figure not clear

10. 1

11. 2



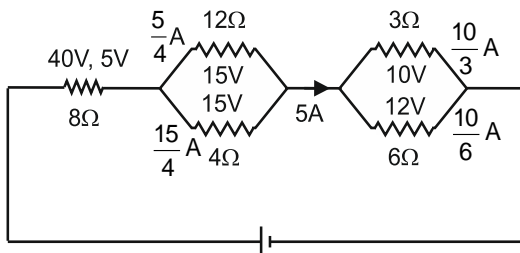
$x = 43 - 25 = 18$   
 $y = 180 - 2 \times 43$   
 $y = 94$

12. 3

Appliance	Quantity	Watt	Time per day	Bill for April
Bulb	3	100	5 hours	$\frac{3 \times 100 \times 5}{1000} \times 30 \times 5 = 225$
Fan	1	1500	7	$\frac{1 \times 1500 \times 7}{1000} \times 30 \times 5 = 1575$
Iron	1	1100	2	$\frac{1 \times 1100 \times 2}{1000} \times 30 \times 5 = 330$

Total = 1575 + 225 + 330 = 2130

13. 1



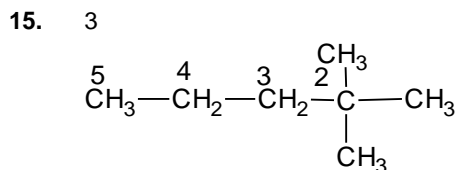
AB → 65V

8Ω → 40V

4Ω → 15V

6Ω → 10V

14. 1  
Symbol of hydrogen as per Dalton's sign of element is a dot in a circle use

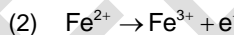


2, 2 – Dimethyl pentane

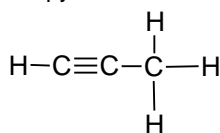
16. 2  
Extraction of gold metal is done by leaching method  
 $4\text{Au(s)} + 8\text{CN}^- (\text{aq}) + 2\text{H}_2\text{O(aq)} + \text{O}_2 (\text{g}) \rightarrow 4[\text{Au}(\text{CN})_2] (\text{aq}) + 4\text{OH}^- (\text{aq})$   
 $2[\text{Au}(\text{CN})_2]^- (\text{aq}) + \text{Zn(s)} \rightarrow 2\text{Au(s)} + [\text{Zn}(\text{CN})_4]^{2-} (\text{aq})$

17. 3  
Li > Be is correct option

18. 4  
Oxidation means loss of electron  
(1)  $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$



19. 1  
Propyne structure 8 bonds



20. 2  
 $\text{Al}_2\text{O}_3 + 3\text{H}_2\text{O} \rightarrow 2\text{Al}(\text{OH})_3$

21. 4  
Average atomic mass of Sr according to Dobereiner's triad was 88.

22. 3  

$$\begin{array}{ccc} \text{CH}_3\text{OH} & \xrightarrow[\text{K}_2\text{Cr}_2\text{O}_7]{[\text{O}]} & \text{HCOOH} \\ \text{methyl alcohol} & & \text{formic acid} \end{array}$$

23. 2  
Homologous series  
 $\text{C}_2\text{H}_6\text{O}$ ,  $\text{C}_3\text{H}_8\text{O}$ ,  $\text{C}_4\text{H}_{10}\text{O}$

24. 3  
X = Ge and Y = Sb

25. 1  
 $\text{Cu(s)} + 4\text{HNO}_3 (\text{aq}) \rightarrow \text{Cu}(\text{NO}_3)_2 (\text{aq}) + 2\text{NO}_2 (\text{g}) + 2\text{H}_2\text{O(l)}$

26. 4  
 $\text{Ca}(\text{HCO}_3)_2$   
No of atoms in its mole =  $11 \times N_A$   
=  $11 \times 6.022 \times 10^{23}$  atom

27. 1  
C<sup>14</sup> is used in carbon dating method
28. 4  
Cells in the root of onion show formation of cell plate exactly along the midline of the cell, completing cytokinesis. Plant cells perform cytokinesis by cell plate formation whereas animal cells perform cytokinesis by cleavage method.
29. 3  
One haploid egg cell and two haploid polar nuclei are found in the embryo – sac of angiospermic flower before fertilization.
30. 3  
As per wildlife protection Act 1972, Clause 49A trading of rare animals has been completely banned.
31. 2  
'Moloi' Jungle is situated in Assam state
32. 2 B denotes Pelvic fin
33. 1  
Octopus is most clever animal among all non-chordates. It can change its colour.
34. 4  
Rifamycin, which is obtained from gram-positive bacterium *Amycolatopsis mediterranei* is effective against tuberculosis.
35. 4  
*Bacillus and Streptomyces*
36. 1  
Rohu and Catla are used for freshwater fishery
37. 3  
Consumption of tobacco products lead to cancer of the lungs in human beings
38. 4  
Increasing awareness about disaster management among the general Public through training programmes, mass media etc.
39. 2  
Pneumonia disease is caused by bacteria – *Streptococcus pneumoniae*
40. 3  
Abscisic acid is a growth retarding hormone. It acts as general plants growth inhibitor by slowing down plant growth.
41. 3  
Annales school gave a new direction to history writing. It was recognised now that history is not only about the political events, kings, great leaders and accordingly politics, diplomacy and wars but also about the climate, local people, agriculture, trade, technology, means of communication, social divisions and their collective psychology, etc. in the historical times.
42. 1  
The French historian of the twentieth century, Michel Foucault brought forth a new concept in historiography. He, in his book, 'Archaeology of Knowledge', argued that the prevailing practice of arranging historical events in a chronological order is not right.
43. 2  
Ishwardas Nagar, Bhimsen Saxena, Khafi Khan and Niccolao Manucci were among the historians of Aurangzeb's times whose accounts are important sources of Mughal history.
44. 3

The Maratha style was influenced by the Rajput and European styles of painting.

45. 1  
The Ambreshwar temple at Ambarnath near Mumbai, Gondeshwar temple at Sinnar near Nashik, Aundha Nagnath temple in the Hingoli district are a few finest examples of the Hemadpanti style.
46. 2  
Kesari began to publish articles about the nationwide situations, books in the native languages and the politics in England.
47. 3  
'Pragati', now a defunct journal, was started (1929) and edited by Tryambak Shankar Shejwalkar.
48. 2  
Patan at Gujarat- Rani ka Vav, Hampi- Group of Monuments, Chandigarh- The Capital Complex, West Bengal- Chhau Dance
49. 4  
*Bal Shivaji*, the movie made by Prabhakar Pendhakar, Dinakar D. Patil made a movie entitled, *Dhanya te Santaji Dhanaji*, Bhalaji Pendharkar made a movie entitled *Bajirao Mastani*, Baburao Painter also created historical movies like *Kalyanacha Khajina*, *Bajiprabhu Deshapande* and *Netaji Palkar*.
50. 1  
In 1970-1971, the State also started 'Rural Water Supply Scheme' for sinking wells and providing piped water.
51. 3  
The ancient Indian literature and epics mention various games such as games of dice (*dyut*), wrestling, Horse and Chariot races and chess.
52. 1  
*Kathasaritsagara* has very interesting descriptions of games and toys. There are descriptions of flying dolls.
53. 2
54. 2  
In 1956, the Department of Atomic Energy set up 'Apsara', a nuclear reactor functioning on atomic energy.
55. 4  
First Five Year Plan consisted of measures to lay the foundations of planned economic development.
56. 2  
The renowned author-poet Vishnu Waman Shirwadkar, also known as Kusumagraj wrote *Natasamrat*, a play styled after Shakespeare's well known play, 'King Lear'.
57. 4  
The basic structure of the constitution generally includes following provisions.  
1. Republican and democratic form of government  
2. Federal structure of the Constitution.  
3. Promotion of unity and integrity of the nation  
4. Sovereignty of the nation  
5. Secularism and supremacy of the constitution
58. 4  
After the Green Revolution, the farmers movement became more active and effective
59. 3  
Art 51 of the Indian Constitution:  
1. Promote international peace and security.  
2. Maintain just and honourable relations between nations.  
3. Foster respect for international law and treaty obligations in the dealings of organised people with one another.  
4. Encourage settlement of international disputes by arbitration.
60. 2

The candidate distributes items of household use and To appeal on the basis of caste and religion to get support are the two conditions that is violation of Code of Conduct.

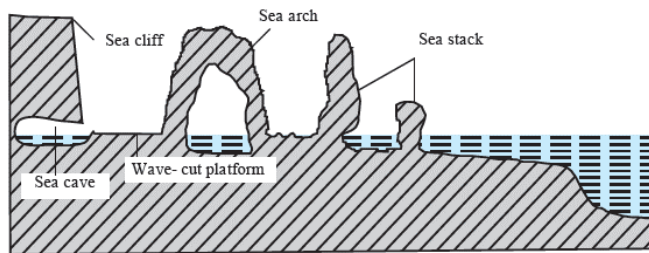
61. 3  
Dr. Rajendrasinh Rana also known as 'Waterman of India' has brought Water revolution in Rajasthan

62. 1

63. 2  
Mahatma Gandhi, Vinoba Bhave and Jayprakash Narayan put forth the idea of partyless democracy.

64. 1  
Many countries in the world have made efforts to increase representation of women. From this perspective, changes are taking place in India as well. The 73rd and 74th amendment reserved 33% of seats for women in local self-governing institutions.

65. 3



66. 1  
Increase in life expectancy is an indicator of development of that society

67. 2

68. 1  
The Jaisalmer in Western Rajasthan is driest part of India. It receives less than 120mm of rainfall annually.

69. 2  
1. Brazil with a population of around 19 crores, according to Census 2010, it ranks 5th in the world . It is also the fifth in the world with respect to area.  
2. The density of population is around 23 persons per sq.km.  
3. India's population is around 121 crores according to Census 2011  
4. India's average population density is 382 persons per sq.km. as per 2011 Census.

70. 3  
As compared to Brazil, India has a denser network of transport. About 85 per cent of passenger and 70 per cent of freight traffic are carried by roads every year

71. 2  
In West direction Brazil has no sea coast.

72. 1  
Pantanal- Anacondas, Looks like lion- Golden Tamrin, Fish Variety- Pink Dolphins, Huge bird Size- Condors

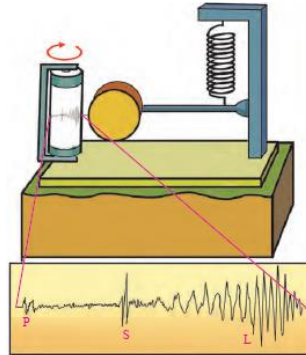
73. 1  
Brazil major trading partners are Germany, USA, Canada, Italy, Argentina and Saudi Arabia and India

74. 3  
Ecotourism is developing at a faster rate in Brazil.

75. 4  
Shivalik, Lower Himalaya and Himadri are mountain ranges from Southern Himalayan ranges to Northern Himalayan Ranges

76. 2  
India is located in Northern and Eastern Hemisphere

77. 4  
The logo is of OPEC- Organisation of Petroleum Exporting Countries
78. 3  
Goa is the most urbanized state of India
79. 4  
Ganga tributary is Yamuna, Sindhu tributary is Satluj, Krishna tributary is Tungabhadra and Bhima.
80. 4  
L Waves are produced directly on the surface.



81. 4  
Let the number of Rs. 1 coins = x  
Rs. 2 coins = y

$$x + y = 50 \quad \dots(i)$$

$$x + 2y = 75 \quad \dots(ii)$$

From (i) and (ii),

$$y = 25, \quad x = 25$$

82. 2  
 $x^2 - bx + 6 = 0$ , Roots are  $\alpha, \beta_1$   
 $x^2 - 6x + c = 0$ , Roots are  $\alpha, \beta_2$   
Roots  
 $\beta_1 = 3k, \quad \beta_2 = 4k$   
 $3\alpha k = 6 \Rightarrow \alpha k = 2$   
 $4\alpha k = c \Rightarrow \alpha k = \frac{c}{4}$   
 $\Rightarrow c = 8$   
 $\therefore b = 5 \quad [\alpha = +2]$

83. 4  
Assume speed of stream = x km/hr  
Downstream time =  $\frac{d}{x+6}$   
Upstream time =  $\frac{d}{6-x}$   
 $\frac{2d}{x+6} = \frac{d}{6-x} \Rightarrow 6 = 3x$   
 $x = 2$

84. 1  
 $a_3 + a_8 = 7 \Rightarrow a + 2d + a + 7d = 7$   
 $\Rightarrow 2a + 9d = 7 \quad \dots(i)$   
Also,  
 $a_7 + a_{14} = -3$   
 $2a + 19d = -3 \quad \dots(ii)$   
From (ii) and (i),

$$10d = -10$$

$$d = -1$$

$$a = \frac{7+9}{2} = 8$$

$$\therefore a_{10} = a + 9d = 8 - 9 = -1$$

85. 1

Let Blue balls = x

Total balls = x + 5

$$P(B) = 2 \cdot P(R)$$

$$\frac{x}{x+5} = \frac{2.5}{x+5}$$

$$x = 10$$

$$\text{Total} = 15$$

86. 2

$$2^n + 1 = 2^n + 1^n = (2+n)(2^{n-1} + 2^{n-2} + \dots + 1)$$

$$= 3K$$

Divisible by 3

87. 2

$$a = 1; d = 3$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$2380 = \frac{n}{2}[2 \times 1 + (n-1)3]$$

$$4760 = 2n + 3n^2 - 3n$$

$$4760 = 3n^2 - n$$

$$3n^3 - n - 4760 = 0$$

$$n = 40$$

$$a_{40} = 1 + (40-1)3 = 1 + 117 = 118$$

88. 3

In leap year

Remaining days = {SM, MT, TW, W, ThF FSa, SaS}

$$n(S) = 7$$

$$\text{Probability of 53rd Sunday} = \frac{2}{7}$$

89. 3

$$\frac{N}{2} = \frac{250}{2} = 125$$

$$\text{Median} = L + \left( \frac{\frac{N}{2} - cf}{f} \right) \times h$$

$$= 220 + \left[ \frac{125 - 100}{80} \right] \times 10$$

$$= 220 + 3.125$$

$$= 223.125$$

90. 3

$$(a+b)^2 = 4 \times 3 = 12$$

$$a^2 + b^2 = 12 - 2ab = 12 - 6 = 6$$

$$(a^2 + b^2) = 6^2$$

$$a^4 + b^4 + 2a^2b^2 = 36$$

$$a^4 + b^4 = 36 - 2 \times 9 = 36 - 18 = 18$$

91. 2



$$\frac{QN}{QM} = \frac{5.3}{3.2} \quad \dots[\text{By BPT}]$$

$$\frac{QR}{NP} = \frac{3.2}{5.3+3.2}$$

$$NP = \frac{6.4 \times 8.5}{3.2} = 17$$

92. 1

$$(x+2)^2 + (y-5)^2 = (x-6)^2 + (y+1)^2$$

$$\Rightarrow 16x - 12y = 37 - 29 \Rightarrow 4x - 3y = 2$$

93. 3

Only (1) and (2)  
Sum of any two sides triangle is always greater than its third side.

94. 2

$$y = 13\sqrt{6} \text{ m}$$

$$x^2 = (13\sqrt{6})^2 \times 2$$

$$x = 13\sqrt{6} \cdot \sqrt{2}$$

$$x + y = 13\sqrt{2} + 13\sqrt{6}$$

$$= 13\sqrt{3}(\sqrt{2} + 2)$$

\*95. 4

By angle bisector theorem

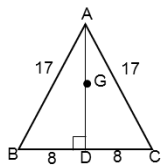
$$\frac{x}{2x + \frac{5}{3}} = \frac{x - \frac{3}{5}}{2x + \frac{3}{2}}$$

$$\frac{3}{2}x + \frac{6}{5}x - \frac{5}{3}x = -1$$

$$x = \frac{-30}{31}$$

Sides cannot be negative. Bonus marks should be there.

96. 1



$$AD = \sqrt{17^2 - 8^2}$$

$$AD = 15$$

$$AG = \frac{2}{3} \times 15 = 10 \text{ cm}$$

97. 3

$$(\sin \theta + \cos \theta)^2 = \frac{9}{4}$$

$$2 \sin \theta \cos \theta = \frac{5}{4}$$

$$\sin \theta \cos \theta = \frac{5}{8}$$

98. 2

$$AP = \sqrt{169 + 9} = \sqrt{178}$$

$$AM = \sqrt{178 - 25} = \sqrt{153}$$

99. 4

$$\frac{BN}{AM} = \frac{BC}{AC} \dots [\Delta BNC \sim \Delta AMC]$$

$$BN = \frac{8\sqrt{3} \times 7}{14\sqrt{3}} = 4$$

100. 4

$$\begin{aligned} \text{Area of shaded region} &= (7\sqrt{3})^2 - \frac{1}{4} \times \frac{22}{7} \times (7\sqrt{3})^2 \\ &= 49 \times 115.5 \\ &= 31.5\text{cm}^2 \end{aligned}$$

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