

FIITJEE

MAHARASHTRA NATIONAL TALENT SEARCH EXAMINATION, 2018-19 STAGE – 01

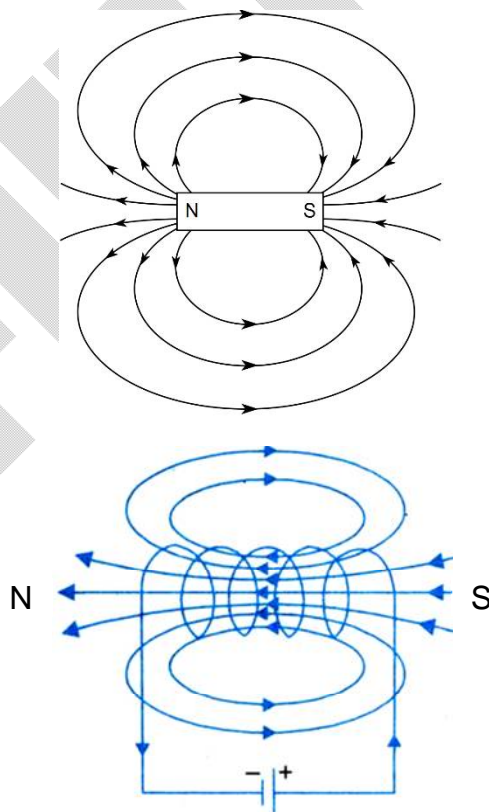
SCHOLASTIC APTITUDE TEST (SAT)

SOLUTIONS

PHYSICS

1. (1)
As $g \propto \frac{1}{R_e}$
 $\therefore g_p > g_e$

2. (3)



3. (4)
First three can be explained by refraction.
4. (2)
 $V = 3.14 \text{ km/s} \Rightarrow 3.14 \times 10^3 \text{ ms}^{-1}$

$$d = 2\pi r \Rightarrow 2\pi(R + 4)$$

$$d = 2\pi(6400 + 3600) \Rightarrow 2\pi \times 10000 \text{ km}$$

$$T = \frac{2\pi r}{V} \Rightarrow T = \frac{2\pi \times 10000 \times 10^3}{3.14 \times 10^3}$$

$$T = 20000 \text{ s}$$

5. (3)

Let us suppose that time require to cover 1° angle is t

$$\therefore T_{160^\circ} = 160 \times t \text{ and } T_{10^\circ} = 10 \times t$$

As we know $T^2 \propto R^3$

$$\therefore \left(\frac{T_{10}}{T_{160}}\right)^2 = \left(\frac{R_{10}}{R_0}\right)^2$$

$$\left(\frac{10 \times t}{160 \times t}\right)^2 = \frac{R_{10}^3}{140^3 \times 10^{18}}$$

$$\therefore R_{10}^3 = \frac{10 \times 10 \times 140 \times 140 \times 140 \times 10^{18}}{160 \times 160}$$

$$\Rightarrow R_{10} = 5.57 \times 10^8 \text{ kms}$$

$$\therefore R_{10} = 56 \times 10^7 \text{ kms}$$

6. (4)

A-ii, B-iv, C-i, D-iii

7. (1)

$$H = mC\Delta T$$

$$H = 5 \times 4186 \times 80$$

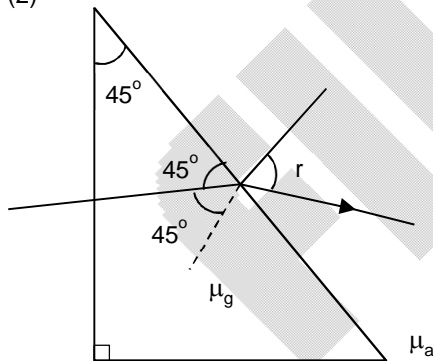
$$H = 400 \times 4186$$

$$H = 1674400 \text{ J}$$

$$H = 1674.40 \text{ kJ}$$

$$(\because C = 4186 \text{ J/kg})$$

8. (2)



$$\frac{\sin 1}{\sin r} = \frac{\mu_a}{\mu_g}$$

$$\frac{\sin 45^\circ}{\sin r} = \frac{1}{1.5}$$

$$\frac{1}{\sqrt{2}} \times 1.5 = \sin r$$

$$\sin r = \frac{3}{2\sqrt{2}}$$

*9. No option is matching

$$\frac{40 \times 1.6 \times 10^{-19} + n \times 1.6 \times 10^{-19}}{1} = 8$$

$$\left(i = \frac{q}{t}\right)$$

$$6.4 - n \times 1.6 \times 10^{-19} = 8$$

$$n = 10^{19}$$

10. (3)

Electromotor, voltmeter and ammeter converts electrical energy to mechanical energy as in ammeter and voltmeter needle will deflect.

11. (1)

Case I:

$$m = \frac{v}{u} = \frac{1}{2}$$

$$2v = -4$$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow u = -3f \text{ and } v = \frac{3f}{2}$$

Case II:

$$-2 = \frac{V'}{(u+30)}$$

$$V' = -2(u+30)$$

$$\frac{1}{f} = \frac{1}{v'} - \frac{1}{(u+30)}$$

$$\frac{1}{f} = \frac{1}{-2(u+30)} - \frac{1}{(u+30)}$$

$$\frac{1}{f} = \frac{-3}{2(u+30)}$$

$$-3f = -6f + 60$$

$$f = 20 \text{ cm}$$

$$(\because u = -3f)$$

12. (3)

$$n \pm \frac{360}{\theta} \text{ (formula), Here } (n-1) = 6 \Rightarrow n = 6$$

$$\therefore 6 = \frac{360}{x} \Rightarrow x = 60^\circ$$

$$\text{Now, } n = \frac{360}{x-30} \Rightarrow n = \frac{360}{30}$$

$$n = 12 \text{ (even)}$$

$$\therefore \text{ number of images} = (n-1) = 11$$

13. (2)

Since water has maximum density at 4°C , therefore its volume must be minimum at 4°C

CHEMISTRY

14. (1)

1950

15. (1)

Fe_2O_3

16. (3)

Catalyst

17. (3)

D Block

18. (2)

$\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$

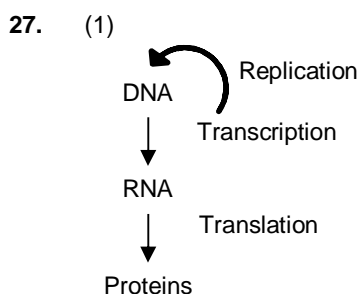
19. (4)

Bauxite formula - $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$

$$\% \text{ of } \text{Al}_2\text{O}_3 \text{ in Bauxite} = \frac{102}{138} \times 100 = 73.91$$

- 20. (2)
CaCO₃
- 21. (1)
-OH
- 22. (2)
Neon
- 23. (1)
Voting ink
- 24. (1)
Methanol
- 25. (2)
Na₃AlF₆
- 26. (2)
Cl, K, Br

BIOLOGY



- 28. (4)
Anaphase of mitosis, the sister chromosomes are separated in opposite direction.
- 29. (2)
Conjoined twins are two babies who are born physically connected to each other → the early embryo only partially separates to form two individuals.
- 30. (1)

Calyx – sepals	}	accessory whorls
corolla – petals		
androceium → stamen	}	essential whorls
gynoceium → carpal / pistil		
- 31. (3)
Tiger, Sundarbans sanctuary of west Bengal is a tiger reserve, known as man eating tiger.
- 32. (4)
Bat is a flying mammal.
- 33. (1)
Saccharomyces cerevisiae is as known yeast plays an important role in fermentation.
- 34. (4)
Interferon are produced by viral infected cells to protect the adjacent cells from viral infection. But hemophilia is X linked disorder, congenital disease.
- 35. (3)
Alcohol decreases the efficiency of nervous system liver as well as lifespan of a person.
- 36. (4)
- 37. (4)

Adrenal gland is present above the kidney (Renal of gland)

38. (1)
Glycolysis breaks down glucose into pyruvic acid, gets converted to acetyl-coA which together with oxaloacetic acid citrate. Enters into Krebs cycle.
39. (3)
Columnar epithelium – secretion of digestive juice
Wearing of organs – squamous epithelium
Reabsorption of useful material – cuboidal epithelium
40. (2)
1 Long cylindrical, metameric ally segmented
2 Triploblastic, bilaterally symmetrical, eucoelomate
3 They have setae or parapodia or suckers for locomotion.
Annelida

SOCIAL STUDIES

41. (1)
Voltaire
42. (4)
The Indian war of independence nationalist history.
43. (2)
Pune
44. (3)
Nagara style
45. (3)
James Augustus Hickey
46. (3)
Saint Namdev
47. (1)
Thaki
48. (2)
Books
49. (4)
Mumbai – Chhatrapati Shivaji Maharaj Vastu Sangrahalay / Ahmedabad – The Calico Museum of Textiles
50. (1)
Michel Foucault
51. (4)
Indo-Gothic
52. (2)
Journalist
53. (2)
29th August
54. (2)
Mrinal Gore
55. (2)
Automobile industry
56. (4)
Kapil Dev
57. (3)
73rd and 74th

58. (2)
Art. 324
59. (1)
President
60. (1)
Chota Nagpur – Kolam
61. (4)
Environmental Degradation
62. (2)
Decentralization of power
63. (2)
England
64. (3)
Dr. Manmohan Singh
65. (4)
North
66. (3)
Ice
67. (1)
The population of India is more
68. (4)
Lack of employment opportunities
69. (2)
120
70. (2)
Sabarmati
71. (3)
Dispersed
72. (4)
Encyclopedia
73. (1)
A-3, B-4, C-2, D-1
74. (2)
Myanmar
75. (4)
A-4, B-3, C-1, D-2
76. (3)
Uruguay
77. (2)
Marajo
78. (1)
A-3-R ,B-4-S, C-1-Q, D-2-P
79. (1)
Fertile Land – Plain land – Availability of water
80. (3)
Khasi Hill

MATHEMATICS

81. (4)

82. (3)

$$\alpha + \beta = -3$$

$$\alpha\beta = \frac{-5}{2}$$

Quadratic equation $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

$$x^2 + 3x - \frac{5}{2} = 0$$

83. (3)

In ordinary year \rightarrow 365 days

i.e., 52 weeks + 1 day

So, probability of having 53 thursday = $\frac{1}{7}$

84. (2)

Number are in the Given $\rightarrow 6K + 5$

So list of numbers 17, 23, 29, ..., 497

$$497 = 17 + (N-1)6$$

$$\Rightarrow N = 81$$

85. (2)

$$\left| \begin{array}{cc} 5 & 3 \\ 3 & 2 \\ 3 & 3 \\ 4 & 2 \end{array} \right| = \frac{5}{3} \times \frac{3}{2} - \frac{7}{2} \times \frac{3}{4} = \frac{-1}{8}$$

86. (4)

$$3ax^2 + 2bx + c = 0$$

Let roots are α, β

$$\alpha + \beta = \frac{-2b}{3a}, \quad \alpha\beta = \frac{c}{3a}, \quad \frac{\alpha}{\beta} = \frac{2}{3}$$

$$\text{So } \frac{\alpha + \beta}{\alpha - \beta} = \frac{5}{-1}$$

$$(\alpha + \beta)^2 = 25(\alpha - \beta)^2$$

$$\frac{4b^2}{9a^2} = 25[(\alpha + \beta)^2 - 4\alpha\beta]$$

$$\frac{4b^2}{9a^2} = 25\left(\frac{4b^2}{9a^2} - \frac{4c}{3a}\right)$$

$$\frac{100c}{3a} = 24 \times \frac{4b^2}{9a^2}$$

$$8b^2 = 25ac$$

87. (2)

In A.P. $a_1 + a_N = a_2 + a_{n-1} = 2$ middle tan

$$\text{Now } S_N = \frac{N}{2}[a_1 + a_N]$$

$$S_N = \frac{N}{2}[2 \times m] = mN$$

88. (3)

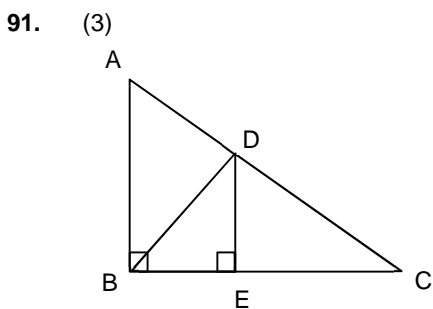
$$\text{Median} = \ell + \frac{\frac{N}{2} - \text{c.f.}}{f} \times h$$

$$= 30 + \frac{35 - 22}{10} \times 10 = 43$$

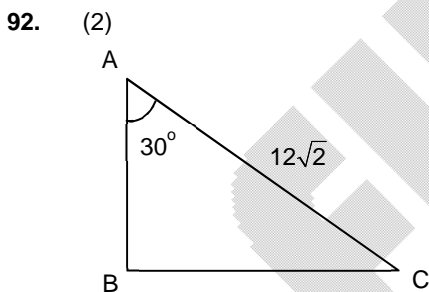
89. (2)
 Favorable Cases:- (1,1)
 (1,2)(2,1)
 (1,4),(2,3),(3,2),(4,1)
 (1,6),(2,5),(3,4),(4,3),(5,2),(6,1)
 (5,6),(6,5)

So probability = $\frac{15}{36} = \frac{5}{12}$

90. (1)
 Let number is ab
 So $8(a+b) - 5 = 10(a-b) + 3$
 $\Rightarrow 3b - a = 1$
 Only 83 is satisfying the above condition

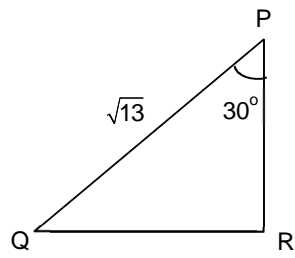


$AD = BD = DC$
 $\angle DBE = 20^\circ, \angle DCC = 20^\circ$
 So, $\angle CPE = 7^\circ$
 $\Rightarrow \angle CDE - \angle DBE = 70 - 20 = 50^\circ$



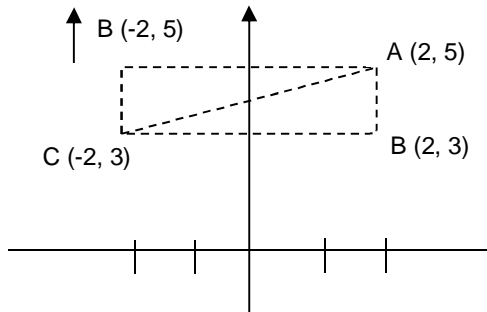
$\sin 30^\circ = \frac{BC}{12\sqrt{2}} \Rightarrow BC = 6\sqrt{2}$
 $\cos 30^\circ = \frac{AB}{12\sqrt{2}} \Rightarrow AB = 6\sqrt{6}$
 So perimeter = $6\sqrt{2} + 6\sqrt{2} + 12\sqrt{2}$

93. (3)
 $\pi \rightarrow$ Irrational Number
94. (4)
95. (1)
 $ED \parallel BC \Rightarrow 20^\circ = \angle EBD = \angle DBC$
 So $\angle EDB = 20^\circ$ (exterior angle sum property)
 and $\angle DCB = 50^\circ$ (angle sum property)
96. (4)



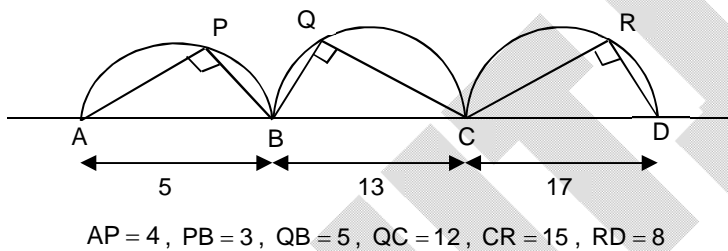
$$\begin{aligned} & \operatorname{cosec} 60^\circ - \sec 60^\circ \\ &= \frac{2}{\sqrt{3}} - 2 = 2\left(\frac{1}{\sqrt{3}} - 1\right) \end{aligned}$$

97. (1)



98. (4)

99. (4)



*100. Option not Match