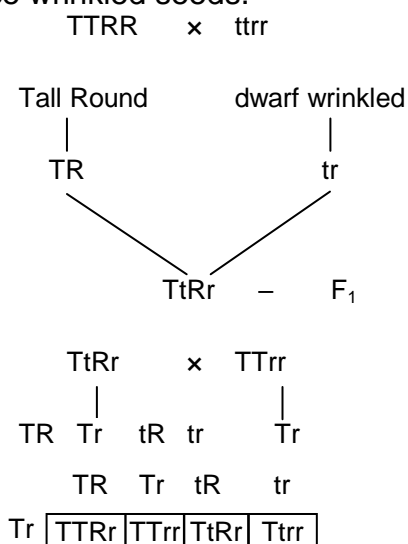


FIITJEE SOLUTIONS
NTSE STAGE 2 2020-21
SCHOLASTIC APTITUDE TEST (SAT)

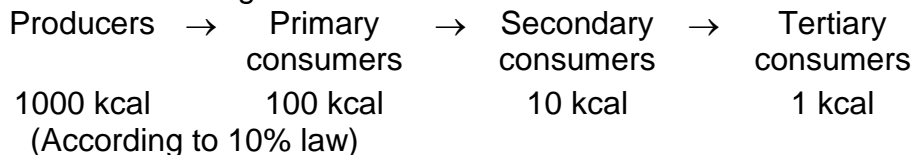
1. Plasma membrane is a semipermeable membrane, water can move by osmosis and gases can cross by diffusion.
2. Vacuole in plant cell is larger than animal cell.
3. Mitochondria are more in cardiac muscles to generate more energy.
4. Grafting is possible among dicot plants due to presence of cambium.
5. Collenchyma have thickened wall at the corners & have either very little intercellular spaces or absent.
6. The *Marsilea* do not produce seed but *pinus* produces.
7. No option is correct (according to given information in the question).
8. Cyanobacteria (Blue green algae) if placed in pure water they will swell but not burst due to presence of cell wall.
9. The genotype of II-3 should be Hh and II-4 should be hh as these are formed by the cross of Hh × hh.
10. 50% plants will produce wrinkled seeds.



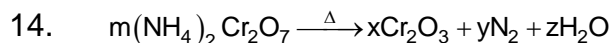
50% of plants will have wrinkled seeds.

11. If no CO_2 then no photosynthesis and no oxygen & earth would be devoid of life.

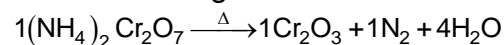
12. Producers will get 1% of 100000 kcal



13. No fertilisation will be there so no fruit formation.



After Balancing



∴ The stoichiometric coefficients m, x, y and z are respectively 1, 1, 1, 4.



As per balanced chemical equation,

1 mole of SO_2 produces → 3 mole of sulphur

⇒ 64 g SO_2 produces → 96 grams Sulphur

∴ 1 gram SO_2 produces → $\frac{96}{64}$ grams sulphur
= 1.5 g sulphur.

Hence statement 2 is wrong.

16.

Sample	With blue litmus	With red litmus	With phenolphthalein
A	–	Turns blue	Turns pink
B	–	–	–
C	Turns red	–	–

The data provided in the above table indicates that the pH of the following solutions will be as follows:

pH of solution A > 7

pH of solution B = 7

pH of solution C < 7

Now as per options provided,

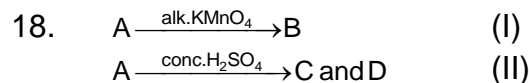
pH of $\text{CH}_3\text{COO Na}_{(\text{aq})} > 7$ (salt of strong base and weak acid)

pH of $\text{NaCl}_{(\text{aq})} = 7$ (salt of strong acid and strong base)

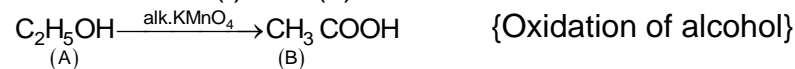
pH of $\text{FeCl}_3 < 7$ (salt of strong acid and weak base)

∴ A = CH_3COONa ; B = NaCl ; C = FeCl_3 .

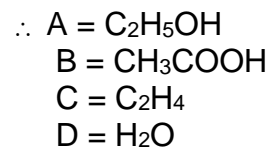
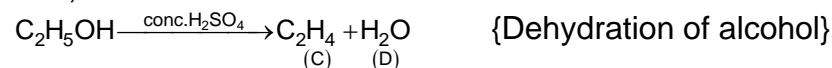
17. Acetic acid and water are miscible with each other, so separating funnel method can't be useful. The correct method of separation of miscible liquids is distillation. Hence statement III is wrong.



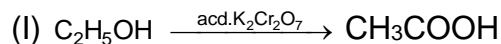
The reactions (I) and (II) are as follows



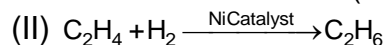
And,



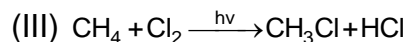
19. The reactions are as follows:



This is a redox reaction (Oxidation of alcohols)



This is an addition reaction (Hydrogenation of alkenes)

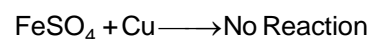


This is a substitution reaction (chlorination of methane)

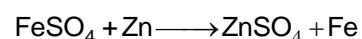


This is an elimination reaction (Dehydration of alcohol)

20. Beaker A



Beaker B

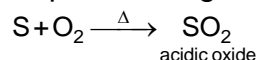


The above observations indicate that Zinc is most reactive and copper is least reactive.

Hence the order of reactivity will be



21. Sulphur upon heating in a spatula in presence of air forms,



SO_2 being an acidic oxide when comes in contact with moist Blue litmus paper, turns the litmus paper red, due to the formation of sulphurous acid.

27. Speed of train = $90 \times \frac{5}{18} = 25 \text{ m/sec}$

$$T = \left[\frac{1500}{25} - \frac{1250}{300} \right] + \frac{250}{300}$$

$$T = 56.67 \text{ sec}$$

28. Speed during upstream = 10 km/hr
Speed during downstream = 20 km/hr

$$\begin{aligned} \text{Average speed} &= \frac{2v_1v_2}{v_1+v_2} = \frac{2(10)(20)}{10+20} \\ &= \frac{40}{3} \text{ km/hr.} \end{aligned}$$

29. Let Q travels x and P travels $(525 - x)$ m

$$\therefore x = \frac{1}{2}(2)t^2 = t^2 \quad (1)$$

$$\text{and } 525 - x = 20t \quad (2)$$

From (1) and (2)

$$t^2 + 20t - 525 = 0$$

$$t = 15 \text{ sec}$$

$$\text{and } x = t^2 = 225 \text{ m}$$

30. Rate of energy dissipation

$$\Rightarrow \frac{\frac{1}{2}mv^2}{t} = \frac{\frac{1}{2}(50 \times 10^{-3})(80)^2}{8}$$

$$\Rightarrow 20 \text{ J/sec.}$$

31. After 3 bounces total energy will be

$$\Rightarrow \left(\frac{9}{10} \right)^3 mgh \Rightarrow \left(\frac{9}{10} \right)^3 (0.1)(10)(1)$$

$$= \left(\frac{9}{10} \right)^3 \text{ J}$$

at half the maximum height

$$\text{K.E} = \frac{\left(\frac{9}{10} \right)^3}{2} = 0.36 \text{ J}$$

32. $T = \text{true weight} - \text{B. Force}$

$$T = (3g) - \frac{Q}{3} \left(\frac{3}{\rho} \right) (g) = 2g$$

$$\therefore \text{Spring balance reads } 2 \text{ kg}$$

33. 1 Kg coal produces $20 \times 10^6 \times \frac{25}{100}$
 $\Rightarrow 5 \times 10^6$ J/kg

1 Kwh = 3.6×10^6 J.

\therefore for 1 kwh coal required

$$= \frac{3.6 \times 10^6}{5 \times 10^6} = \frac{3.6}{5} \text{ kg}$$

Cost will be $= \frac{3.6}{5} \times 5 = \text{Rs.}36$

34. Option is self explanatory.

35. $2d = v \times t$

$$d = \frac{v \times t}{2}$$

$$d = \frac{1450 \times 4}{2}$$

$= 2.900$ km.

36. Image of tip will form at pole itself for image of other point

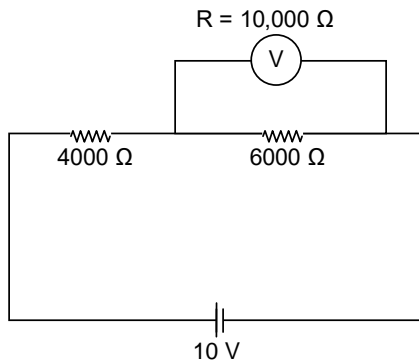
$u = -10$ cm; $f = \frac{-40}{2} = -20$ cm

as $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

we get $v = +20$ cm

\therefore Size of image will be 20 cm.

37.



$$R_{eq} = \frac{10,000 \times 6,000}{(10,000 + 6,000)} + 4000$$

$R_{eq} = 7750 \Omega$

$$i = \frac{10}{7750}$$

$$v_1 = \frac{10}{7750} \times 4000 = 5.16$$

So $v_2 = 10 - 5.16$

$$v_2 = 4.838.$$

$$38. \quad P_A = \frac{E^2}{N^2 R}; P_B = \frac{E^2}{R}$$

$$P_{AT} = \frac{E^2}{NR}; P_{BT} = \frac{NE^2}{R}$$

$$\therefore \text{We get } P_E = N^2 P_A$$

$$39. \quad \frac{1}{3}R \text{ in series with } (2R \parallel 2R) \text{ in series with } (2R \parallel 2R)$$

We get R_{AB} as $2R$

$$40. \quad \text{Average Speed} = \frac{\text{total distance}}{\text{total time}}$$

$$\text{Average Speed} = \frac{1 + 1' + (1 - 1')}{\frac{1}{2} + \frac{1'}{1.5} + \frac{(1 - 1')}{0.5}} \quad (1)$$

$$\text{Given } \frac{1'}{1.5} = \frac{1 - 1'}{0.5} \therefore 1' = \frac{3l}{4} \quad (2)$$

From (1) and (2)

We get average speed = 1.33 m/sec

41.

$$x^2 + 2ax + a^2 \begin{array}{r} \frac{x - 2a}{x^3 - 3px + 2q} \\ \frac{x^3 + a^2x + 2ax^2}{-2ax^2 + x(-3p - a^2) + 2q} \\ \frac{-2ax^2 - 4a^2x - 2a^3}{x(-3p + 3a^2) + (2q + 2a^3)} \end{array}$$

$$-3p + 3a^2 = 0 \quad \dots (i)$$

$$2q + 2a^3 = 0 \quad \dots (ii)$$

$$\Rightarrow a^2 = p \Rightarrow a = \sqrt{p}$$

Put in (ii)

$$\Rightarrow 2q + 2(\sqrt{p})^3 = 0$$

$$\Rightarrow q = -(\sqrt{p})^3$$

$$q = -p\sqrt{p}$$

$$q^2 = p^3$$

$$\begin{aligned}
 42. \quad & \left(3^{\frac{1}{2}} - 1\right) \left(3^{\frac{1}{2}} + 3^{\frac{1}{4}} + 1\right) \left(3^{\frac{1}{2}} - 3^{\frac{1}{4}} + 1\right) \\
 &= \left(3^{\frac{1}{2}} - 1\right) \left[\left(3^{\frac{1}{2}} + 1\right) + 3^{\frac{1}{4}}\right] \left[\left(3^{\frac{1}{2}} + 1\right) - 3^{\frac{1}{4}}\right] \\
 &= \left(3^{\frac{1}{2}} - 1\right) \left[\left(3^{\frac{1}{2}} + 1\right)^2 - \left(3^{\frac{1}{4}}\right)^2\right] \\
 &= (\sqrt{3} - 1) [3 + 1 + 2\sqrt{3} - \sqrt{3}] \\
 &= (\sqrt{3} - 1) [4 + \sqrt{3}] \\
 &= 3\sqrt{3} - 1
 \end{aligned}$$

$$\begin{aligned}
 43. \quad & mx + 2y = 10 && \dots(i) \\
 & 3x - 2y = 0 \\
 & \Rightarrow 3x = 2y && \dots(ii) \\
 & \text{Put in equation (i)} \\
 & (m + 3)x = 10 \\
 & x = \frac{10}{m + 3} \\
 & y = \frac{3}{2} \times \frac{10}{m + 3} = \frac{15}{m + 3} \\
 & \text{Q } x \text{ and } y \text{ are integers} \\
 & \therefore m = -2, 2, -8 \\
 & \text{Option (2) or (3) correct.}
 \end{aligned}$$

$$\begin{aligned}
 44. \quad & a_n = a + (n - 1)d \\
 & \text{If } d \text{ increased to } d + 1 \\
 & a_n^1 = a_n + 19 \\
 & a + (n - 1)(d + 1) = a + (n - 1)d + 19 \\
 & (n - 1)d + n - 1 = (n - 1)d + 19 \\
 & n = 20 \\
 & a_5 = 28 \\
 & a + 4d = 28 && \dots(i) \\
 & \frac{a + a + (n - 1)d}{2} = 61 \\
 & 2a + 19d = 122 && \dots(ii) \\
 & \text{From equation (i) and (ii)} \\
 & 2a + 19d = 122 \\
 & \underline{2a + 8d = 56} \\
 & \quad 11d = 66 \\
 & d = 6 \\
 & a = 4 \\
 & a_{10} = a + 9d \\
 & = 4 + 54 \\
 & = 58
 \end{aligned}$$

45. $s_n = 300$ years

$a = 9$ years

$d = \frac{1}{4}$ year

$$\frac{n}{2}\{2a + (n-1)d\} = 300$$

$$\frac{n}{2}\left\{18 + (n-1) \times \frac{1}{4}\right\} = 300$$

$$n\{72 + n - 1\} = 300 \times 8$$

$$n^2 + 71n - 2400 = 0$$

$$(n + 96)(n - 25) = 0$$

$$n = 25$$

$$a_{25} = 9 + 24 \times \frac{1}{4}$$

$$= (9 + 6) \text{ year}$$

$$= 15 \text{ years}$$

46. let number of persons = n

$$\text{Individual share} = \frac{27000}{n}$$

$$\frac{27000}{n+20} = \frac{27000}{n} - 480$$

$$\Rightarrow 480 = 27000 \left[\frac{1}{n} - \frac{1}{n+20} \right]$$

$$\Rightarrow n(n+20) = \frac{27000 \times 20}{480}$$

$$\Rightarrow n^2 + 20n - 1125 = 0$$

$$\Rightarrow (n + 45)(n - 25) = 0$$

$$\Rightarrow n = 25$$

47. area of $\triangle ABC = \frac{1}{2}|0(y-21) + x(21-0) + 18(0-y)|$

$$= \frac{1}{2}|21x - 18y|$$

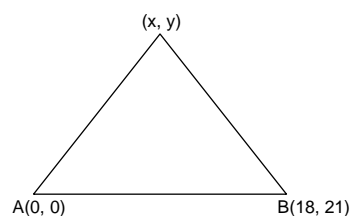
$$= \frac{3}{2}|7x - 6y|$$

Q x and y are integer

\therefore it will be minimum at $x = y = 1$

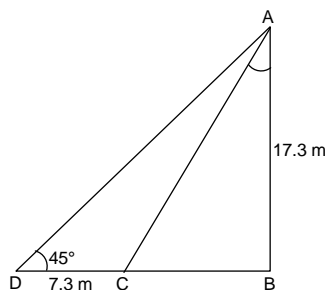
\therefore minimum integral value of $|7x - 6y| = 1$

\therefore minimum non zero area of $\triangle ABC = \frac{3}{2} \times 1 = \frac{3}{2}$ sq. unit

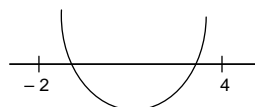


48. $\frac{1 - \cos \theta}{\sin \theta} = \frac{1}{5}, 0^\circ < \theta < 90^\circ$
 $\Rightarrow 5 - 5\cos \theta = \sin \theta$
 $\Rightarrow 5\sec \theta - 5 = \tan \theta$
 $\Rightarrow 5\sqrt{1 + \tan^2 \theta} = 5 + \tan \theta$
 $\Rightarrow 25(1 + \tan^2 \theta) = 25 + 10\tan \theta + \tan^2 \theta$
 $\Rightarrow 24 \tan^2 \theta - 10\tan \theta = 0$
 $12\tan^2 \theta - 5\tan \theta = 0$
 $\tan \theta(12\tan \theta - 5) = 0$
 $\tan \theta = 0$ or $\tan \theta = \frac{5}{12}$
 $1 + \tan \theta = 1$ or $\frac{17}{12}$

49. let $BC = x$ m
 $DB = x + 7.3$ m
 $AB = DB$
 $BC = 10$ m
 let $\angle BAC = \theta$
 $\tan \theta = \frac{BC}{AB}$
 $= \frac{10}{17.3}$
 $= 0.578$
 $\theta = 30^\circ$

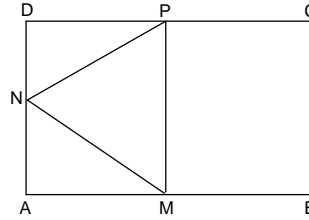


50. $x^2 - 2mn + m^2 - 1 = 0$
 $\alpha + \beta = 2m$
 $\alpha\beta = m^2 - 1$
 $\therefore -2 < \frac{2m}{2} < 4$
 $-2 < m < 4$
 $f(-2) > 0$ $f(4) > 0$
 $m^2 + 4m + 3 > 0$ $m^2 - 8m + 15 > 0$
 $(m + 3)(m + 1) > 0$ $(m - 3)(m - 5) > 0$
 $m < -3$ or $m > -1$ $m < 3$ or $m > 5$
 $\therefore -1 < m < 3$

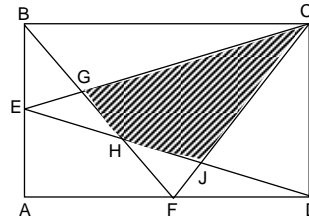


51. $n(s) = 11 \times 11 = 121$
 $p(E) = \frac{13}{121}$
 $E = \{(0, 0), (1, 0), (1, 1), (2, 0), (-1, 0), (-2, 0), (0, 2), (0, 1), (0, -1), (0, -2), (-1, 1), (1, -1), (-1, -1)\}$

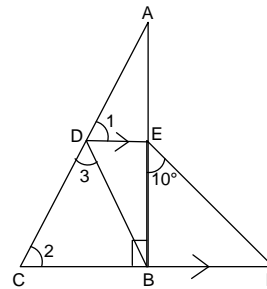
52. P is mid point of CD.
 $ar(ANM) = \frac{1}{4} ar(AMPD)$
 $= \frac{1}{8} ar(ABCD)$
 $\therefore \frac{ar(ANM)}{ar(ABCD)} = \frac{1}{8}$



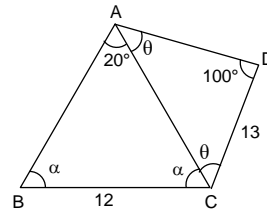
53. by carpet law
 $area(GHJC) = ar(BGE) + ar(AEHF) + ar(FJD)$
 $= 503 + 1113 + 408$
 $= 2024$



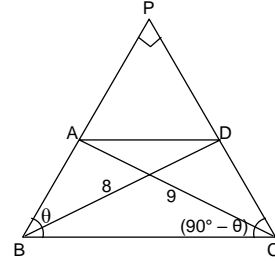
54. $BD = BC$
 $\angle BEF = 10^\circ$
 $\because DE \parallel BC$
 $\therefore \angle 1 = \angle 2 = \angle 3 = \theta$ (let)
 but $\angle DBC = 90 - 10 = 80^\circ$
 $\therefore 2\theta = 100^\circ$
 $\therefore \theta = 50^\circ$



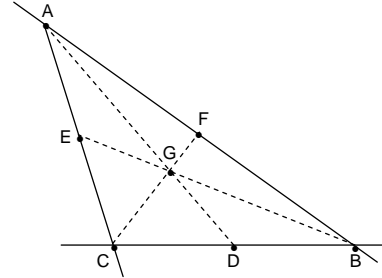
55. $AD = DC$
 In $\triangle ADC$
 $2\theta = 80^\circ$
 $\therefore \theta = 40^\circ$
 In $\triangle ABC$
 $AB = AC$
 $\therefore 2\alpha = 160^\circ$
 $\alpha = 80^\circ$
 In $\square ABCD$
 $\angle ABC + \angle ADC = 180^\circ$
 $\therefore ABCD$ is a cyclic \square
 \therefore length of DC will be double of length CB
 \because Angle opposite to chord CD is double of angle opposite to chord BC.
 \therefore the given information is wrong



56. In $\triangle PBD = BP^2 + PD^2 = BD^2$... (i)
 In $\triangle PAD = PA^2 + PC^2 = AC^2$... (ii)
 from equation (i) and (ii)
 $BP^2 + PA^2 + PD^2 + PC^2 = BD^2 + AC^2$
 $(BP^2 + PC^2) + (PA^2 + PD^2) = BD^2 + AC^2$
 $BC^2 + AD^2 = 9^2 + 8^2$
 $AD = \sqrt{81 + 64 - 100}$
 $AD = 3\sqrt{5}$
 $\text{ar}\triangle ADEF = (AD)^2 = 45$

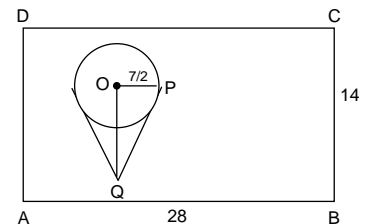


57. using power of point for the circle w.r.t. point 'C'
 $CD \cdot CB = CG \cdot CF$
 $\frac{a}{2} \cdot a = \frac{2}{3} CF^2 = \frac{2}{3} \left(\frac{a^2}{2} + \frac{b^2}{2} - \frac{c^2}{4} \right)$
 $\frac{a^2}{2} = \frac{a^2}{3} + \frac{b^2}{3} - \frac{c^2}{6}$
 $a^2 + c^2 = 2b^2$
 also, 'C' is obtuse $\Rightarrow \cos C < 0$
 $a^2 + b^2 < c^2$
 $\Rightarrow a^2 + b^2 < 2b^2 - a^2$
 $\Rightarrow 2a^2 < b^2$
 $\Rightarrow \frac{a^2}{b^2} < \frac{1}{2}$
 $\Rightarrow \frac{a}{b} < \frac{1}{\sqrt{2}}$



58. $ax^2 + bx + c = 0$
 $Q \ a + b + c = 0$
 $1 + \beta = -\frac{b}{a}, 1 \cdot \beta = \frac{c}{a}$
 $\beta = \frac{c}{a}$
 Roots are $1, \frac{c}{a}$

59. $OP = r = \frac{7}{2}$
 $OQ = 3$
 area of top circular surface of pit =
 $\pi \left(\frac{7}{2} \right)^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = \frac{77}{2}$
 $= 38.5 \text{ m}^2$
 area of the plot on which dug soil is spreaded = $28 \times 14 - 38.5$
 $= 353.5 \text{ m}^2$



$$\text{volume of dug soil} = \frac{1}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times 3 = 38.5 \text{ m}^3$$

$$\therefore \text{value of increment in the level of remaining plot} = \frac{38.5}{353.5}; 10.9 \text{ cm}$$

60. $\sum x_i - 50n = -10$
 $\sum x_i = 50n - 10$... (i)
 $\sum x_i - 46n = 70$
 $\sum x_i = 46n + 70$... (ii)

From (i) and (ii)

$$50n - 10 = 46n + 70$$

$$4n = 80$$

$$n = 20$$

$$\sum x_i = 990$$

$$\bar{x} = \frac{990}{20} = 49.5$$

$$\therefore \bar{x} - 48 = 49.5 - 48 = 1.5$$

61. Arrangement of the division of power between different religious communities is not true.
62. The president appoints a leader who can muster majority support in the Lok Sabha and can prove majority support in the Lok Sabha.
63. B and C options are not presenting true picture.
64. In some cases caste division leads to tensions, conflict and even violence.
65. A political prisoner during Pinochet dictatorship.
66. Freedom to acquire, hold and dispose any property any where in country.
67. A – G, B – H, C – E, D – F.
68. It lays down limits on the powers of the govt. And tells us what the rights of the citizens are.
69. Right to freedom.
70. Both option A and D
71. Non-availability, inaccessibility, non-affordability.

72. Option A, C and D
73. Options a, b, d, e, f
74. Both A and R are true and R is the correct explanations of A.
75. Fall in productivity of the agricultural workers.
76. Rate of extraction of all resources is less than rate of its regeneration and creation.
77. Rithish, Rahul, Ramesh, Ramu
78. Let the carpenter pay on the basis of hours of work.
79. Disguised unemployment.
80. Right to choose
81. Jharkhand – Odisha – Andhra Pradesh – Telangana – Maharashtra – Madhya Pradesh
82. Ganga – Narmada – Godabari – Krishna – Penneru – Palar
83. Formation of high pressure over Tibetan plateau.
84. Meghalaya
85. Both are true and statement 1 provides explanations for statement 2.
86. Chennai is not an inland riverine port.
87. 8:16 am – 6:48 am
88. Both are true
89. Wetlands
90. A3, B1, C4, D2
91. I, II, and IV
92. Oak leaves stand for heroism.
93. I, III and IV

- 94. I, II and IV
- 95. I, II and III
- 96. III and IV
- 97. Both are true and R is the correct explanation of A.
- 98. I, II and IV
- 99. Acquiring new territories to enhance the area of the mother country.
- 100. I, II and IV

FIITJEE Answer Key-

NTSE Stage 2 2020-21 (SAT)

1.	4	2.	3	3.	4	4.	1
5.	2	6.	2				
7.	no option correct (according to given information)					8.	3
9.	1	10.	3	11.	3	12.	4
13.	1	14.	3	15.	2	16.	2
17.	2	18.	3	19.	3	20.	1
21.	2	22.	1	23.	2	24.	3
25.	2	26.	4	27.	2	28.	3
29.	2	30.	3	31.	2	32.	4
33.	2	34.	3	35.	2	36.	3
37.	4	38.	4	39.	1	40.	2
41.	3	42.	3	43.	2 and 3	44.	3
45.	2	46.	2	47.	1	48.	2
49.	2	50.	1	51.	4	52.	3
53.	option incorrect						
54.	1	55.	wrong information				
56.	4	57.	2				
58.	4	59.	2	60.	1	61.	4
62.	2	63.	2	64.	4	65.	4
66.	4	67.	2	68.	1	69.	3
70.	3	71.	3	72.	2	73.	4
74.	1	75.	1	76.	4	77.	2
78.	2	79.	3	80.	2	81.	3
82.	4	83.	3	84.	2	85.	3
86.	2	87.	3	88.	4	89.	2
90.	4	91.	4	92.	4	93.	3
94.	4	95.	2	96.	3	97.	4
98.	4	99.	4	100.	2		