

NTSE STAGE II

CODE: 13 – 15

SAT

Held on: May 13, 2018

HINTS & SOLUTIONS

1. 4
Sol. The six carbon compound glucose molecule is broken down into 3 carbon compound molecule Pyruvic acid and Lactic acid in muscle cells during Anaerobic condition.
 2. 4
Sol. The flow of impulse in a neuron is
Cell Body Axon Nerve terminal
 3. 1
Sol. The Medulla oblongata of brain regulates blood pressure of human.
 4. 4
Sol. Edward Jenner's contribution for the eradication of small pox is his finding that the cow pox infection protects the person from subsequent infection from small pox.
 5. 2
- III. Organization of cells.
6. 1
Sol. In a forest ecosystem, energy transfer in the biotic world proceeds from the autotrophs. Energy flow is unidirectional and some amount of energy lost from one trophic level to the other.
 7. 2
Sol. In highly pesticide polluted pond the maximum amount of pesticide per gram of body mass accumulated in fishes due to Biomagnification.
 8. 1
Sol. The paddy plants of backwater paddy field of Kerala wilt during noon onwards everyday because the rate of water absorption is less than the rate of transpiration in the afternoon.
 9. 1
Sol. In the given experiment the shoot is showing positive Phototropism and root is showing positive Geotropism.
 10. 1
Sol. Raw Banana has bitter taste while ripe Banana has sweet taste. It happens because of conversion of starch to sugar.
 11. 2
Sol. The sequence of events during formation of fruit by sexual reproduction is as follows Gamete Fertilisation Zygote Embryo
-
-

12. 1

- A. RrYY - Round & yellow
- B. Rryy - Round and green
- C. rrYy - Wrinkled & yellow
- D. rryy - Wrinkled & green

13. 2

Sol. The selected combination of Eukaryotic organism in descending order is as follows:
Tissue, Cell, Nucleus, Chromosome, DNA

14. 1

Sol. The gaseous by-product O_2 of photosynthesis in plant is essential for Respiration that releases energy.

15. 3

Sol. $PV = nRT$ V & RT are constant
P n

16. 4

Sol. $r_{avg} = \frac{1}{M}$
M r_{avg}
 $O_2 < NH_3 < He < H_2$

17. 1

Sol. $CaCO_3$ CaO CO_2
10 g 4.4 g
Weight of test tube + $CaCO_3 = 30.08$
Weight of test tube = $30.08 - 10 = 20.08$

18. 4

Mixture	Method Used
Petroleum products	Fractional distillation
Camphor and rock salts	Sublimation
Cream from milk	Centrifugation
Coloured components in a dye	Chromatography

19. 4

Sol. $3Pb(NO_3)_2 + 2AlCl_3 \rightarrow 2Al(NO_3)_3 + 3PbCl_2$

20. 1

Sol. More is the atomic number i.e. nuclear charge more is the deflection.

21. 2

Sol. Basicity order: $NaCl < NaHCO_3 < Na_2CO_3 < Ca(OH)_2$ pH order is same.

22. 3

Sol. $2C_4H_{10} + 11O_2 \rightarrow 8CO_2 + 6H_2O$
11 32 = 352 g

23. 3

Sol. Position in activity series	Reduction process
The bottom of the series	Found in native state
The top of the series	Electrolysis
The lower regions of the series	Reduction by heat alone
The middle of the series	Reduction using carbon or some other reducing agent

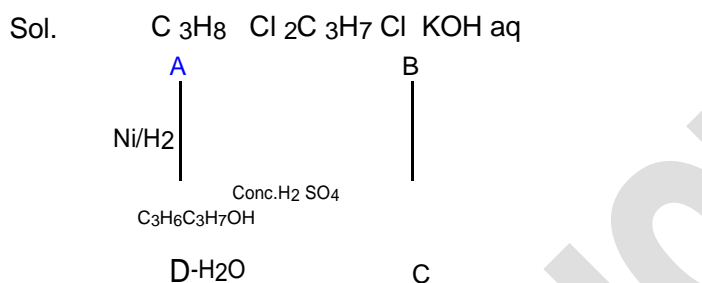
24. 2

Sol. Chemical properties of element depends on
 (a) Position of element in a period/group
 (b) Atomic number of the element
 (c) Electronic configuration

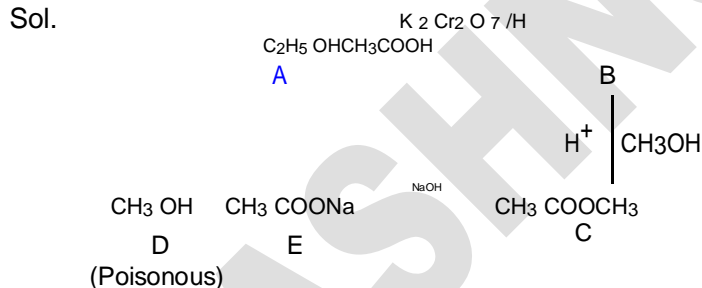
25. 3

Sol. A – Carbon B – Nitrogen
 C – Silicon D – Phosphorus
 Size of Si is highest, if we consider Electronegativity then Silicon has less capability to gain electron than Nitrogen. If we consider E_A than only 4th statement should be correct.

26. 2



27. 2



28. 3

Sol.

$$R_A \frac{R}{A} R.$$

$$R_B \frac{R}{9A} \frac{R}{9}$$

Ratio of potential drop = $R : \frac{R}{9}$
 =9:1.

29. 3

Sol. For lens A

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

$$\frac{1}{v} - \frac{1}{40} = \frac{1}{30}$$

$$\frac{1}{v} = \frac{1}{30} + \frac{1}{40}$$

$$= \frac{4+3}{120}$$

$$v = 120 \text{ cm}$$

For lens B

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

$$\frac{1}{v} - \frac{1}{90} = \frac{1}{30}$$

$v = 22.5$ cm to right of B.

30. 4

Sol. Time taken for each L length
is $L \frac{3L}{2u} \frac{2L}{5L} \frac{3L}{17L} \frac{u}{2u} \frac{u}{2u}$
 $\frac{2u}{2u}$

31. 3

Sol.

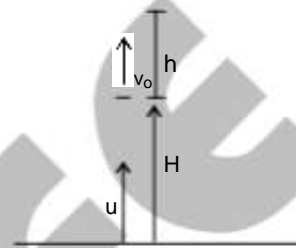
$$h = \frac{1}{2} g T^2$$

$$h = \frac{g T^2}{8}$$

Maximum height = $H + h$
 $= H + \frac{g T^2}{8}$

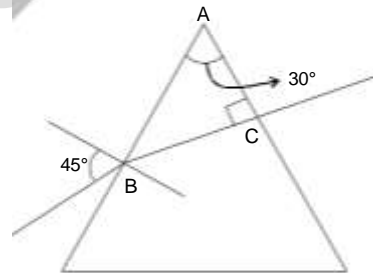
$$u^2 = \frac{H g T^2}{2g} \times \frac{8}{8}$$

$$u = \sqrt{\frac{g T^2}{2} \times \frac{8H}{8}}$$



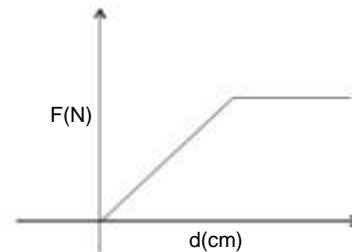
32. 3

Sol. $n_D ABC$
 $C=90^\circ$
 $ABC = 90 - 30^\circ = 60^\circ$
 Angle of refraction = 30°
 $\frac{\sin i}{\sin r} = \frac{\sin 45^\circ}{\sin 30^\circ} = 2$



33. 3

Sol. Buoyant force (F) = $V g$
 $= L^2 d g$



34. 4

Sol. As the gain in kinetic energy is proportional to their mass in all cases so speed will be same.

35. 2

Sol. Acceleration of system = $\frac{36}{9} = 4 \text{ m/s}^2$
 Force pulling the block = ma
 $= 1 \times 4 = 4 \text{ N}$

36. 3

Sol. Acceleration of two cars are equal to each other at an instant earlier than to as there will be a point where slope of car A and car B is same.

37. 2

Sol. Ratio of resistance of 40 W : 50 W : 100 W

$$i_s = \frac{(200)^2}{40} : \frac{(200)^2}{50} : \frac{(200)^2}{100}$$
$$= 5:4:2$$

$$\text{Potential drop across 40 W} = \frac{5}{11}600 = 272.7 \text{ V}$$

$$\text{Potential drop across 50 W} = \frac{4}{11}600 = 218.18 \text{ V}$$

$$\text{Potential drop across 100 W} = \frac{2}{11}600 = 109.09 \text{ V}$$

So both 40 W and 50 W will fuse.

38. 2

Sol. Sound will have more velocity in the solid pipe as velocity of sound is more in solids.

39. 1

Sol. Force will be same in magnitude in both wires and will be in opposite direction.

40. 4

$$\text{Sol. } R_{\text{eq}} \text{ when } k_1 \text{ is closed} = \frac{12 \cdot 3}{15} \cdot \frac{12}{5}$$

$$R_{\text{eq}} \text{ when } k_2 \text{ is closed} = \frac{12 \cdot 4}{16} \cdot \frac{12}{4}$$

Ratio of current = 5 : 4.

41. 3

$$\text{Sol. } \frac{1}{7} \quad \overline{0.142857}$$

$$\frac{1}{13} \quad 0.076923$$

$$\frac{1}{21} \quad 0.047619$$

$$\times 7 \quad 13 \quad 21 \quad 41$$

42. 1

Sol. Unit's digit of 12^n can be 2, 4, 8 or 6 unit's digit of $12^n + 1$ can be 3, 5, 9 or 7 only.

43. **No option is applicable**

Sol. As per the question, the roots are in the ratio 1 : 2 : 4. So, the roots may be p, 2p, 4p where p (the ratio constant) is the h.c.f of all the roots and p is a Natural Number. If k=0, then the all the 3 roots become equal to zero which violates the given condition. So the data given in the question is ambiguous.

44. 1

Sol. Sum of numbers in 10^{th} group = (sum of 110 odd numbers) – (sum of 90 odd numbers)

$$110^2 - 90^2$$
$$200 \cdot 20$$
$$4000$$

45. 2

Sol. $x^4 - 6x^3 + 16x^2 - 25x + 10 = x^2(2x - k) + 4x - 8 + k$
 $2k - 9 + k^2 - 8k + 10 = 0$
 $x^2 - 2kx + 9 - k^2 = 0$

$k = 5$
 $a = k^2 - 8k + 10$
 $= 25 - 40 + 10$
 $= -5$

46. 3

Sol. $x^2 - 3x + 4 = 0$
 Roots 1, 4

If common root = -1
 $2k - 5 = 0$
 $k = 3$
 If common root = 4
 $32 - 4k + 5 = 0$
 $h = \frac{27}{4}$

47. 2

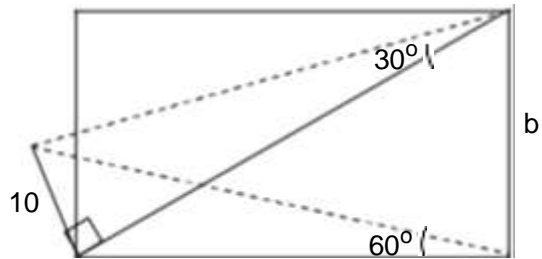
Sol. $0 = x - 45, \cos x = \sin x$
 $\cos x = \sin x = 0$

48. 1

Sol. $\tan 30^\circ = \frac{10}{b}$

$\frac{1}{\sqrt{3}} = \frac{10}{b}$
 $b = 10\sqrt{3}$
 $\tan 60^\circ = \frac{10}{b}$
 $\sqrt{3} = \frac{10}{b}$

$b = \frac{10\sqrt{3}}{\sqrt{3}} = 10$
 $b = \frac{10}{\sqrt{3}}$
 $b^2 = \frac{100}{3}$
 $b = \frac{10\sqrt{3}}{3}$
 $b = \frac{10\sqrt{3}}{3}$
 $b = \frac{10\sqrt{3}}{3}$
 Area = $\frac{1}{2} \times 10 \times \frac{10\sqrt{3}}{3} = \frac{50\sqrt{3}}{3}$



49. 1

Sol. Let side of square = x

x

Then radius of incircle -

Radius of circum circle $\frac{\sqrt{2}}{2}x$

Ratio of area $\frac{\frac{x^2}{2}}{\frac{\sqrt{2}}{2}x} = \frac{1}{2}$

50. 3

Sol. Time to fill pool

$\frac{\frac{1}{2} \cdot 2.75 \cdot 36 \cdot 10.5}{\frac{22}{7} \cdot \frac{7}{100} \cdot \frac{7}{100} \cdot 5000} = 6 \frac{3}{4}$ hours

51. 4

Sol. height of cone = h

radius of cone $\frac{h}{\sqrt{3}}$ [vertical angle is 60°]

radius of sphere $\frac{3}{4}h$

volume of sphere $\frac{4}{3}\pi (\frac{3}{4}h)^3 = 81$

52. 3

Sol. Let the heights of the smaller and larger part be h1 and h2 respectively.

$\frac{3^2}{2} h_1^3 = \frac{24}{h_1^3} = \frac{3^2}{2} h_2^3 = \frac{15}{h_2^3}$
 $\frac{27}{4} h_1^3 h_2 = \frac{729}{4}$
 $h_1^3 h_2 = 27$

53. 4

Sol. Let the height be h units

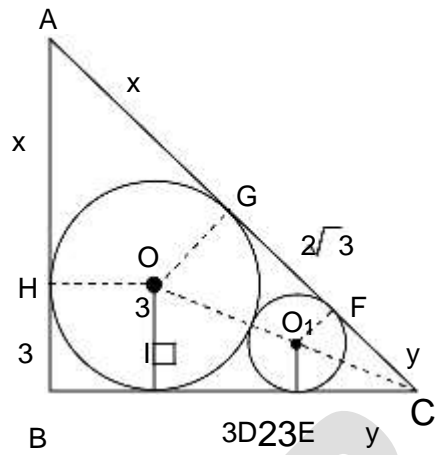
Base of original triangle $2\sqrt{2} h^2$

Base of new triangle $2\sqrt{4} h^2$

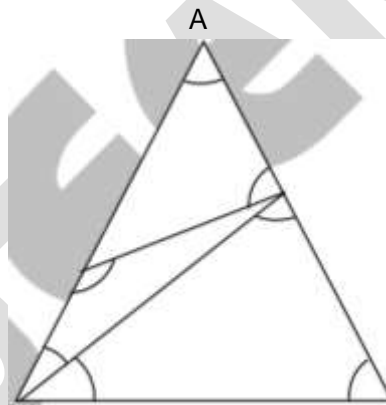
Difference of squares $12 h^2$

54. 4

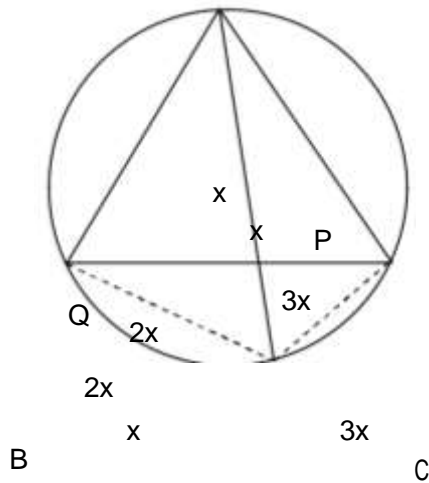
Sol. $IO_1 \perp DE \parallel GF$
 $\sqrt{1642} \sqrt{3}$ Now,
 $CO, E \sim COD$
 $\frac{y}{3} = \frac{1}{3}$
 $y = 2\sqrt{3}$
 $y = \sqrt{3}$
 $3 \times x^2 = 3 \times 3 \times 3^{-2} \times 3 \times 3^{-2}$
 $x = 6 \times 3^{-\frac{1}{2}}$
 $AB = 3 \times 6 \times 3\sqrt{3} = 9 \times 3\sqrt{3}$



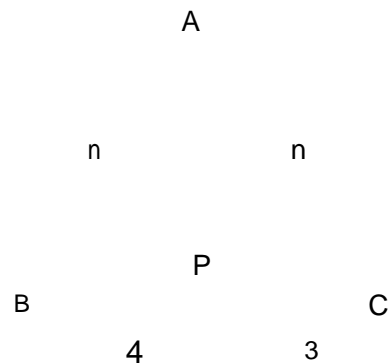
55. 4
 Sol. $7x$
 x
 7
 $AQP = \frac{2}{7}$
 5
 7



56. 3
 Sol. We know $\frac{1}{PQ} = \frac{1}{BQ} = \frac{1}{QC}$
 $\frac{1}{PQ} = \frac{1}{BQ} = \frac{1}{QC}$
 $PQ = 43$
 $PQ = \frac{12}{7}$



57. 4



Q

Sol. $x^2 + y^2 = 4$

One of the part x^2, y^2 equal to 0

If $x^2 = 0$ then $x = 0$, and possible value for y are 2 and -2

Similarly $y^2 = 0$ then $y = 0$ and possible value for x are 2 and -2 .

58. 1

PRASHNOTTAR

Sol. If coordinates are integers then triangle can not be equilateral.

59. 3

= (1, 2, 3, 4, 4, 8, 12, 16, 1, 18, 27, 36, 16, 32, 48,
64) greater than 16 are (18, 27, 36, 32, 48, 64)

So — —

PRASHNOTTAR



60. 4

Sol. Let 11 consecutive numbers are $x, x + 1, x + 2, \dots, x + 10$

$$\text{So } \frac{x + x + 1 + \dots + x + 10}{11} = m$$

$$\text{Now mean of } \frac{x + x + 1 + x + 2 + \dots + x + 16}{17}$$

$$\frac{17x + 136}{17}$$

$$\frac{11m + 55}{17} = \frac{136}{17}$$

$$\frac{11m + 55}{17} = m + 8$$

$$11m + 55 = 17m + 136$$

$$-6m = 81$$

Then % change = $\frac{81}{100} \times 100$

$$= \frac{81}{100} \times 100$$

$$= 81\%$$

$$\% m$$

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