RAJASTHAN NTSE STAGE-I (2017)

CLASS-X [SAT]

HINTS & SOLUTIONS

PHYSICS

1. Using Ist equation of motion
$V = u + at$
$0 = u - 8 \times 3$
$u = 24$ m/s
Using IInd equation of motion
$V^2 = u^2 + 2as$
$0 = (24)^2 + 2(-8) \times 5$
$576 = 16S$
$S = 36$

2. (1)
According to law of conservation of momentum
$m_1u_1 + m_2u_2 = (m_1+m_2) V$
$.01 \times 100 + O = (.01 + 1) V$
$\frac{1}{1.01} = V$
$V \cong 1$ m/s

3. $B.F = V_{dipp} \times D_{liq} \times g$
Density of liq

4. 1 Unit (KWH) = 3.6×10^6 Joule
200 unit will be
$200 \times 3.6 \times 10^6$
7.20×10^8 J

5. (1)
Glass
$V_{solid} > V_{liq} > V_{gas}$

6. (1)
Mass = 15 Kg
$W_{moon} = \frac{M \times g}{6}$
$= 15 \times \frac{9.8}{6} = 24.5$ N

7. (4)
Work done = ΔKE
$W = K_f - K_i$
$= \frac{1}{2} mv^2 - \frac{1}{2} mu^2$
$= \frac{1}{2} \times 2 [(20)^2 - (5)^2]$
= 375 J

8. (2)
Between the principal focus and center of curvature

9. (3)
n_3
As the ray of light bends away from the normal in medium 3 (medium 3 is a rare medium) therefore velocity of light will be maximum in n_3.

10. (3)
Tyndall effect.

11. (3)
Using flemings left hand rule

12. (1)

$$Req = \frac{6}{3} = 2\Omega$$

V = 15 V

$$I = \frac{V}{R} = \frac{15}{2} = 7.5 \text{ A}$$

Current will equally divide in all the 3 resistors
$\therefore$ I = 2.5 A

13. (2)
10^6 K

CHEMISTRY

14. Mass/Mass% = $\frac{\text{mass of solute}}{\text{mass of solution}} \times 100$

mass of solute = 30 gm
mass of solution = 220 + 30
= 250 gm

$$= \frac{30}{250} \times 100$$

= 12% . Option (3) is correct.

15. Cheese is an example of gel. Option (1) is correct.

16. The difference between two miscible liquids A and B is = (65 – 56)° C = 9°C.
The method used for the separation of two miscible liquids having a boiling point difference less than 25°C that is fractional distillation. Option (2) is correct.

17. Magnesium atomic number is 12. (2, 8, 2). Option (4) is correct.

18. 4 gm of O_2 molecule

mole = $\dfrac{\text{given mass}}{\text{m.w.t}} = \dfrac{4}{32}$ = 0.125 mole.

1 mole of oxygen molecule contains = 2NA atoms 0.125 mole of oxygen molecule will contain
= $2 \times 0.125 \times 6.022 \times 10^{23}$ atoms
= 1.5055×10^{23} atoms. Option (3) is correct.

19. F^- contains 10 electrons, 9 protons and 9 neutrons.
At^{+3} contain 10 electrons, 13 protons and 13 neutrons.
So F^- and Al^{+3} both contains same number of electrons.

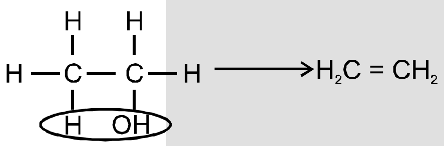
20. The basic solutions have pH more than 7. So solution having pH 10.2 is basic in nature.
Option (4) is correct.

21. The metal which comes at the bottom side of the reactivity series is less reactive in nature. Silver (Ag) is least reactive among the elements given. Option (3) is correct.

22. Aqua Regia is a mixture of Nitric acid and Hydrochloric acid in the ratio of 1 : 3.

23. According to reactivity series, Potassium is mot reactive.
K > Na > Ca > Zn.
Option (3) is correct.

24. conc. H_2SO_4 will remove water from the alcohol.



Ethene. Option (3) is correct.

25. Electronic configuration is 2, 8, 1 that means it is sodium having only one valence electron so the element having the same valence electron will have the similar chemical reactivity.
K – 2, 8, 8, 1.
Option (1) is correct.

26. Methanol is poisnous in nature, so its added in ethanol to make it unfit for drinking.
Option (3) is correct.

MATHEMATICS

41. $\sqrt[3]{\left(x^{1/3}\right)^3 \left(y^{1/3}\right)^3 + 3x^{1/3}y^{1/3}\left(x^{1/3}+y^{1/3}\right)^3}$

$= \sqrt[3]{\left(x^{1/3}+y^{1/3}\right)^3}$

$= x^{1/3}+y^{1/3}$

42. $0.\overline{23} = 0.232323..............$

$0.2\overline{3} = 0.233333............$

$= 0.465656............$

$= 0.4\overline{65}$

43. $f(x) = kx^2 - \sqrt{2}$

$f\left(-\sqrt{2}\right) = 0$

$k\left(-\sqrt{2}\right)^2 - \sqrt{2}\left(-\sqrt{2}\right) + 1 = 0$

$2k + 2 + 1 = 0$

$k = \frac{-3}{2}$

44. $3x + 2y = 13xy$ ....(1)

$4x - 5y = 2xy$ ....(2)

$(1) \times 5 + (2) \times 2$

$15x + 10y = 65xy$

$8x - 10y = 4xy$

$23x = 69xy$

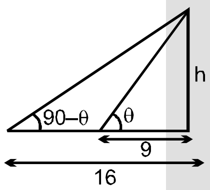
$y = \frac{1}{3}$

Put $y = \frac{1}{3}$ in (1)

$3x + 2 \times \frac{1}{3} = 13x \times \frac{1}{3}$

$\frac{2}{3} = \frac{13}{3}x - 3x$

$\frac{2}{3} = \frac{4x}{3} \Rightarrow x = \frac{1}{2}$

45. 

$\tan\theta = \frac{h}{9}$ ....(1)

$\tan(90 - \theta) = \cot\theta = \frac{h}{16}$ ....(2)

$(1) \times (2)$

$\frac{h^2}{9 \times 16} = 1$

$h = 12.$

46. $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

$= \frac{\sin\theta - 2\sin^3\theta}{\cos\theta\,(2\cos^2\theta - 1)}$

$= \frac{\tan\theta(1 - 2\sin^2\theta)}{\left[2(1 - \sin^2\theta) - 1\right]}$

$= \frac{\tan\theta(1 - 2\sin^2\theta)}{(1 - 2\sin^2\theta)}$ = $\tan\theta$

47. $\angle A + \angle B = 180$

In ΔAPB $\frac{\angle A}{2} + \frac{\angle B}{2} + \angle APB = 180$

$90 + \angle APB = 180$

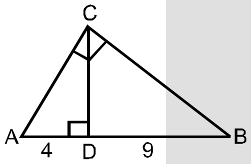
$\angle APB = 90$

48. $\angle AOB = 2x$

In ΔAOB

$2x + y + y = 180$

$x + y = 90.$

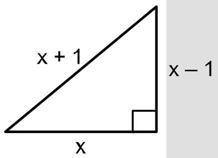
49. 

$AC^2 = AD \cdot AB$

$BC^2 = BD \cdot AB$

$\frac{AC^2}{BC^2} = \frac{AD \cdot AB}{BD \cdot AB} = \frac{AD}{BD}$

$\frac{BC}{AC} = \sqrt{\frac{BD}{AD}} = \sqrt{\frac{9}{4}} = \frac{3}{2}.$

50. 

$(x + 1)^2 = x^2 + (x - 1)^2$

$x^2 + 1 + 2x = x^2 + x^2 + 1 - 2x$

$x^2 - 4x = 0$

$x(x - 4) = 0$

$x = 0, 4$

But x = 0 is not possible.

$\therefore$ $x = 4$

so side, 4, 3, 5

Perimeter = 3 + 4 + 5 = 12.

51. For equal roots

$D = 0$

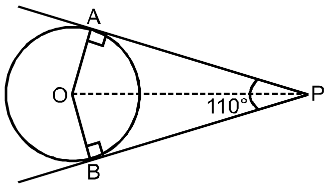
$(3k)^2 - 4(2)(8) = 0$

$9k - 64 = 0$

$k = \pm\sqrt{\frac{64}{9}} = \pm\frac{8}{3}$.

52. $a + b + c = x - y + y - z + z - x = 0$

$\therefore$ $a^3 + b^2 + c^2 = 3abc = 3(x - y)(y - z)(z - x)$.

53. 

$\therefore$ $AOB = 180 - 110 = 70°$

$\angle AOP = \angle BOP = \frac{1}{2}\angle AOB = \frac{1}{2}(70°) = 35°$.

54. S = {TT, TH, HT, HT}

$P(\in) = \frac{3}{4}$.

55. $\tan 25° \tan 35° \tan 45° \tan 55° \tan 65°$

$= \cot 65° \cot 55° (1) \tan 55° \tan 65°$

$= (1) \times (1) \times (1)$

$= 1$

56. $a = 5$

$T_n = 45$

$S_n = 400 = \frac{n}{2}[5 + 45]$

$n = 16$

$T_n = 45 = 5 + 15d$

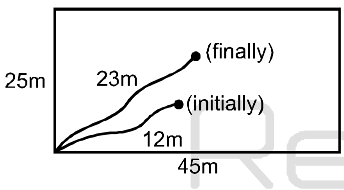
$d = \frac{40}{15} = \frac{8}{3}$

$T_n = a + 3d$

$= 5 + 3 \times \frac{8}{3}$

$= 13$.

57. **(BONUS)** Initial area of grazing field is



$\pi(12)^2 \times \frac{90}{360} = 36\pi$

final grazing field when rope is 23 m.

$\pi(23)^2 \dfrac{90^\circ}{360^\circ} = 529 \times \dfrac{\pi}{4}$

Addition grazing field when rope length increases from 12m to 23 m.

$\dfrac{529}{4}\pi - 36\pi$

$\dfrac{529\pi - 144\pi}{4} = \dfrac{605}{2} = 302.5 \text{ m}^2.$

58. Volume of sphere = $\dfrac{4}{3}\pi r^3$

r = 6 (given)

so vol. of sphere = $\dfrac{4}{3} \times \pi \times 6^3 = \dfrac{4 \times 216 \times \pi}{3} = 288\pi \text{ cm}^3.$

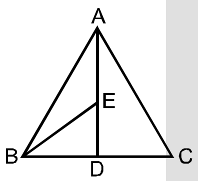
Sphere is melted and recast into cylinder.
so volume of sphere = vol. of cylinder.
$288\pi = \pi r^2 h$
(r = 3 given)
$288\pi = \pi \times 3^2 \times h$

$\dfrac{288}{9} = h$

h = 32 cm.
Option (4) is correct.

59. Mode = 3 Median – 2 Mean
5 = 3 × 3 – 2 Mean
– 4 = – 2 Mean
2 = Mean
Option (2) is correct.

60.



Let ar (ΔABC) = x

ar (ΔABD) = $\dfrac{x}{2}$ (median divide the triangle in two Δ's of equal area)

ar (ΔBED) = $\dfrac{1}{2}$ × ar (ΔABD)

$= \dfrac{x}{4}.$

So $\dfrac{ar(\Delta ABC)}{ar(\Delta BED)} = \dfrac{x}{x/4} = \dfrac{4}{1}.$

4 : 1. Option (3) is correct.