NATIONAL TALENT SEARCH EXAMINATION
NTSE STAGE-II (2015)
CLASS-X [SAT]

HINTS & SOLUTIONS

ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans	3	1	2	4	2	2	1	4	3	1	3	1	4	2	4
Ques.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans	4	4	1	3	2	4	2	2	2	3	1	3	2	3	4
Ques.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans	3	4	2	3	2	2	2	2	2	3	4	1	1	4	2
Ques.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans	2	4	4	4	2	3	3	*	3	4	4	3	2	1	2
Ques.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans	1	4	4	1	1	4	1	1	2	3	3	4	4	3	2
Ques.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans	4	2	2	1	3	1	4	3	1	2	1	4	2	1	2
Ques.	91	92	93	94	95	96	97	98	99	100					
Ans	3	3	4	1, 3	4	4	3	3	2	2					

CHEMISTRY

15. On compressing the gas, no. of collision of molecules at per unit area of the wall of the cylinder increases. Average Kinetic energy of the molecules remains constant as the temperature is constant.

16. Solubility of S = 28.6% at 50° C
Amount of solute in 50 ml of saturated solution = 14.3g at 50° C
at 40°C amount of S separates out = 2.4g in 50 ml
remaining solute = 11.9gin 50 ml

solubility of S at 40° C = $\frac{11.9}{50} \times 100 = 23.8\%$

m/v

17. Given,
amount of C = 6g
amount of oxygen = 32g

C	+	O_2	$\rightarrow$	CO_2
12g		32g		44g

$\because$ 12g of C gives the amount of CO_2 = 44g

$\because$ 1g of C gives the amount gm of $CO_2 = \frac{44}{12}$ g

$\because$ 6g of C gives the amount gm of CO_2

$= \frac{44}{12} \times 6 = 22\text{g } CO_2$

18. Law of conservation of mass is only valid for chemical reactions and not for nuclear reactions.

19. α-particle is doubly positive helium ion ${}_2^4He^{++}$
No. of proton = Z = 2
No. of neutrons = A – Z = 4 –2 = 2
No. of electron = zero

20. m_1 =69 for isotope ${}^{69}Z$
m_2 = 71 for isotope ${}^{71}Z$
x_1 = abundance of ${}^{69}Z$= 60%
X_2 =abundance of ${}^{71}Z$= 40%

Relative atomis mass = $\frac{m_1x_1 + m_2x_2}{100}$

$= \frac{69 \times 60 + 40 \times 71}{100} = 69.8$

21. $2\,Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + 2NO_2 + 3O_2$

A — Yellow — Reddish brown fumes

$Pb(NO_3)_{2(aq)} + 2NaOH_{(aq)} \longrightarrow 2NaNO_{3(aq)} + Pb(OH)_2$

white ppt

The compound A is $Pb(NO_3)_2$

cation is Pb^{2+}

anion is NO_3^-

22. $HCl + Na_2CO_3 \longrightarrow NaCl_{(aq)} + CO_2 + H_2O$

A **B** **C** **D**

gas

$CO_2 + NH_3 + NaCl(aq) \longrightarrow NaHCO_3 + NH_4Cl + NH_4HCO_3$

D **C** **Baking soda**

traces

Hence A & B are HCl & Na_2CO_3

23. $Cu_2S + O_2 \xrightarrow{\Delta} Cu_2O + SO_2$

X **Y**

copper glance

$2Cu_2O + Cu_2S \longrightarrow 6Cu + SO_2$

Y

24. (i) Nitrate ores are rarely available as all nitrates are soluble in water.

(ii) Bond dissociation energy of N_2 is very high as the 3 covalent bonds are present between two nitrogen atoms.

Both the statement are correct but the reason is not correct explanation of assertion.

25. **4** Structural isomers are possible for C_4H_9Br

$H_3C–CH_2–CH_2–CH_2–Br$

$CH_3–CH_2–CH(Br)–CH_3$

$CH_3–C(CH_3)(Br)–CH_3$

$CH_3–CH(CH_3)–CH_2–Br$

26. $CH_3–CH_2–C(=O)–H$

Propanal

Total no. of electrons of C atoms = 3 × 6 = 18 electrons

Total no. of electrons of O atoms = 1 × 8 = 8 electrons

Total no. of electrons of H atoms = 6 × 1 = 6 electrons

Total no. of electrons in one molecule = **32 electrons**

No. of electrons involved in bonding = 2 × total no. of bonds = 2 × 10 = **20 electrons**

27. In periodic table

Electropositive nature increases from top to bottom in a group

Electronegative nature decreases from top to bottom is a group

Atomic size decreases from left to right in a period

PHYSICS

28. Let they will meet at time t. At that time velocity of man must be greater or equal to as that of bus.

$u \geq at$

$t \leq u/a$

$$\frac{1}{2}at^2 + d = ut$$

$$d = ut - \frac{1}{2}at^2$$

$$d \leq u(u/a) - \frac{1}{2}a\frac{u^2}{a^2}$$

$$d \leq \frac{u^2}{2a}$$

29. $v = u + at$

$0 = u - gt$

$t = u/g = n$(total time of ascent)

$$S_{n^{th}} = u + \frac{1}{2}a(2n-1)$$

$$= u - \frac{1}{2}g\left(\frac{2u}{g} - 1\right)$$

$= g/2$

30. $g = \frac{4}{3}\pi\rho Rg$

$= \frac{g_A}{g_B} = \frac{\rho_A}{\rho_B} \times \frac{R_A}{R_B}$

$= 3 \times 2 = 6$

31. In all case displacement is perpendicular to force.
$W_1 = W_2 = W_3 = 0$

33. $f_{disc} = \frac{360}{60} = 6\frac{rev}{sec}$
$f_{sound} = 60 \times f_{disc}$
$= 360$ Hz

35. $R_{eq} = \frac{R}{2} + \frac{R}{3} + \frac{R}{2} = \frac{4R}{3}$

$I = \frac{V}{R_{eq}} = \frac{3V}{4R}$

36. Bulbs are connrected in parallel
so V is same
Heat produced by first bulb $H_1 = 12 \times 10$
$= 120$ J
Simillarily, $H_2 = 2\times 10 = 20J$
$H_3 = 6 \times 10 = 60J$

37. Magnetic field is produced by moving charge

MATHEMATICS

41. LCM 90

42. $x = 5n + 2$
$y = 5m + 4$
$x + y = 5(m + n) + 6$

$\frac{x+y}{5}$ Remainder =1

$\therefore z = 1$

$\frac{2z-5}{3} = -1$

43. $\alpha = a - d$
$\beta = a$
$\gamma = a + d$

$3a = \frac{144}{64}$

$a = \frac{144}{64} = \frac{6}{8} = \frac{3}{4}$

$(a - d)\ 1.\ (a + d) = \frac{15}{64}$

$(a^2 - d^2)\ 1. = \frac{15}{64}$

$\left(\frac{9}{16} - d^2\right) = \frac{15}{64} \times \frac{4}{3} = \frac{5}{16}$

$d^2 = \frac{9}{16} - \frac{5}{16}$

$= \frac{4}{16} = \frac{1}{4}$

$d = \pm \frac{1}{2}$

$(a + d) - (a - d)$
$= a + d - a = d$

$= 2\left(\frac{1}{2}\right)$

$=1$

44. $2x + y = 10$
$(x + y) + x = 10$
$x + y$ is max when $x = 0$
$\therefore (x + y)_{max} = 10$
$2x + y = 10$
$2(x + y) - y = 10$
$\therefore x + y$ is min $y = 0$

$(x + y)_{min} = \frac{10}{2} = 5$

$\therefore (x + y)_{max} + (x + y)_{min} = 10 + 5 = 15$

45. $y + \frac{1}{y} = x$

$y^2 + \frac{1}{y^2} = x^2 - 2$

$7x - 2(x^2 - 2) = 9$
$7x - 2x^2 + 4 = 9$
$2x^2 - 7x + 5 = 0$
$2x(x - 1) - 5(x - 1)$
$(2x - 5)(x - 1) = 0$

$x = \frac{5}{2}$ $x = 1$

$y + \frac{1}{y} = 1$ (Not possible)

$y + \frac{1}{y} = \frac{5}{2}$

on solving we get

$y = 2, \frac{1}{2}$

so only one integral solution possible.

46. .A, B, A + B are in AP

$\therefore$ 2B = A + A + B

2B = 2A + B

B = 2A

$\therefore$ Area of bigger circle = A + B = 3A

$3A = \pi R^2$

$A = \dfrac{\pi R^2}{3}$

$\pi r^2 = \dfrac{\pi R^2}{3}$

$r^2 = \dfrac{4^2}{3}$

$r^2 = \dfrac{16}{3}$

$r = \sqrt{\dfrac{16}{3}} = \dfrac{4}{\sqrt{3}} = \dfrac{4\sqrt{3}}{3}$

47. $c = a + b - 8 \Rightarrow a + b - c = 8$

$a = b + c - 8 \Rightarrow b + c - a = 8$

$b = a + b - 8$

$(a + b + c) = 2(a + b + c) - 24$

$a + b + c = 24$

$a + b - c = 8$

$2c = 16$

$c = 8$

$c = a = b = 8$

area $= \dfrac{\sqrt{3}}{4} 8^2 = 16\sqrt{3}$

48. $\dfrac{1 - \cos x}{\sin x} = \dfrac{1}{3}$

$3(1 - \cos x) = \sin x$

$9(1 + \cos^2 x - 2\cos x) = 1 - \cos^2 x$

$9 + 9\cos^2 x - 18\cos x = 7 - \cos^2 x$

$8 + 10\cos^2 x - 18\cos x = 0$

$5\cos^2 x - 9\cos x + 4 = 0$

$5\cos^2 x - 5\cos x - 4\cos x + 4 = 0$

$5\cos x(\cos x - 1) - 4(\cos x - 1) = 0$

$\cos x = 1$

$\cos x = 4/5$

$\sin x = \dfrac{3}{5}$

$\therefore \cos^2 x - \sin^2 x$

$= \dfrac{16}{25} - \dfrac{9}{25} = \dfrac{7}{25}$

49. $\Delta = \dfrac{abc}{4R}$

$R = \dfrac{abc}{4\Delta}$

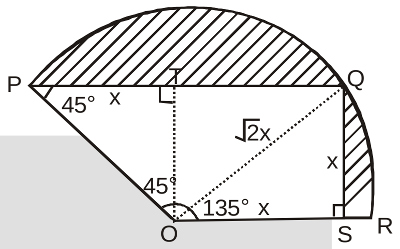
$= \dfrac{2.7.7.14\sin\left(\frac{\theta}{2}\right)}{4.49\sin\theta}$

$= \dfrac{7\sin\left(\frac{\theta}{2}\right)}{2\sin\left(\frac{\theta}{2}\right)\cos\left(\frac{\theta}{2}\right)} = \dfrac{7}{2}\sec\left(\dfrac{\theta}{2}\right)$

$\pi R^2 = \dfrac{22}{7} \times \dfrac{49}{4}\sec^2\left(\dfrac{\theta}{2}\right)$

$= \dfrac{77}{2}\sec^2\left(\dfrac{\theta}{2}\right)$

50.



$\sqrt{2}\,x = 12$

$x = 6\sqrt{2}$

Then area $= \dfrac{135\pi}{360} \times 12^2 - \dfrac{1}{2} \times 3x \times x$

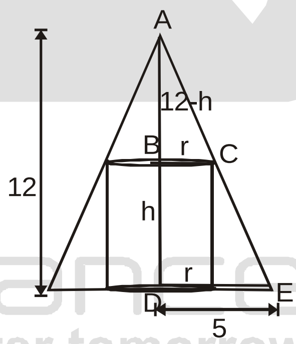
$= \dfrac{54 \times 22}{7} - 108$

$\Rightarrow \dfrac{1188 - 756}{7} = \dfrac{432}{7}$

$= 61\dfrac{5}{7}$

51. % Change $= \dfrac{6\pi r^2}{4\pi r^2} \times 100 = 150\%$

52.



$\Delta ABC \sim \Delta ADE$

$\dfrac{12 - 2r}{r} = \dfrac{12}{5}$

$r = \dfrac{30}{11}$

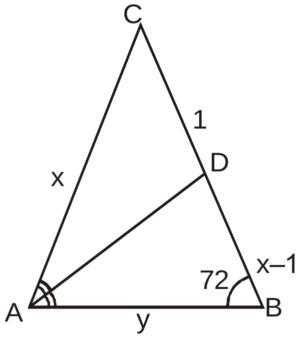
Vol. of cylinder $= \pi r^2 h$

$= \pi r^2(2r)$

$= 2\pi r^3$

$= 127.39$

54.



$\frac{x}{y} = \frac{1}{x-1}$

$x^2 - x = y$

$\cos 72 = \frac{x^2 + y^2 - x^2}{2xy}$

$x^2 - x = 2x \cos 72°$

$x - 1 = 2 \cos 72°$

$x = 1 + 2 \cos 72°$

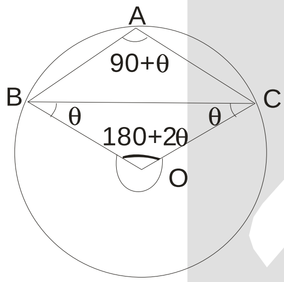
$= 1 + 2\left(\frac{\sqrt{5}-1}{2}\right)$

$= 1 + \frac{\sqrt{5}-1}{2} = \frac{\sqrt{5}+1}{2}$

$\therefore$ BD = x – 1

$= \frac{\sqrt{5}+1}{2} - 1 = \frac{\sqrt{5}-1}{2}$

55.

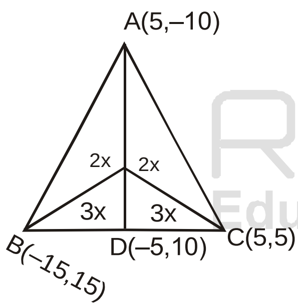


$\angle BAC - \angle OBC$

$= 90 + \theta - \theta$

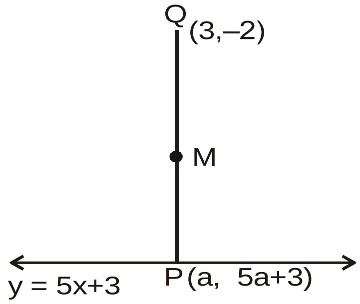
= 90

57.



$\frac{\text{area}\Delta PBC}{\text{area}\Delta ABC} = \frac{6x}{10x} = \frac{3}{5}$

58.



$M\left(\frac{3+a}{2}, \frac{5a+1}{2}\right)$

these coordinats of M satisfy only 2. option.

59. Three digit = $3 \times 3 \times 2 = 18$

Div. by 5 = $2 \times 2 \times 1 + 3 \times 2 = 10$

Req. Probability = $\frac{10}{18} = \frac{5}{9}$

60. 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 +9 + 10 + 11 + 12 + 13 + a + b = 13×15

91 + a + b = 195

a + b = 195 – 91

= 104

Now according to option

51 + 53 = 104

$\therefore$ 2^{nd} larger value is 51