DELTA ACADEMY FOR IIT-JEE & BASIC SCIENCES

DAT 2016 KEY AND SOLUTIONS

ENGLISH AND LOGICAL REASONING

1. 1
2. 2
3. 4
4. 4
5. 2
6. 2
7. 2
8. 2
9. 2
10. 2
11. 3
12. 3
13. 2
14. 2
15. 4

PHYSICS

16. (1)

Acceleration at any point is equal to centripetal acceleration

$$A_c = \frac{v^2}{r} = \frac{(10)^2}{10} = 10 ms^{-2}$$

Average acceleration a = $\frac{\overline{V_2} - \overline{V_1}}{t}$ $\Rightarrow a = \frac{10-(-10)}{\frac{10\pi}{10}} = \frac{20}{\pi} ms^{-2}$

17. (3) From lens makers formula $\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$

18. (2) Kinetic energy is the reason for rise in temperature

19. (4)

Here $R_{eq}=\frac{15\times10}{15+10}+2$

$R_{eq}=6+2=8\Omega$

$\therefore i=\frac{v}{R_{eq}}=\frac{24}{8}=3A$ this 3A current is divides in the inverse ratio of resistance.

$\therefore$ current through 10Ω is 6/5 A.

20. (3) Magnetic field cannot applied force on stationary charge

21. (3)

22. (1)

23. (1) For retraction in first convex lens as object distance is infinity i.e. u=∞ image forms at focus of this lens i.e. 1m from the lens.

Let x be the distance of second lens from this image and this image will acts like a object for second lens as light rays becomes parallel image will forms at infinity due to second lens.

i.e. u=x, v=∞, f=10 cm

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

$\Rightarrow\frac{1}{10}=\frac{1}{\infty}-\frac{1}{-x}$

$\Rightarrow x=10cm$

$\therefore$ total distance between two lenses is 100+10=110cm

24. (2)

Here potential energy is converted into heat energy which is used to melt the ice without raising its temperature

i.e. mgh=ML

$\Rightarrow h=\frac{L}{g}=\frac{80\times4200}{10}=33600m=33.64m$

25. (2)

given $A=60^0$, $\delta_m=30^0$

$$\mu=\frac{\sin\left(\frac{a+\delta_m}{2}\right)}{\sin\frac{A}{2}}=\frac{\sin\left(\frac{60^0+30^0}{2}\right)}{\sin30^0}=\frac{\sin45^0}{\sin30^0}=\frac{\frac{1}{\sqrt{2}}}{\frac{1}{2}}=\sqrt{2}$$

26. (2) For a metal excess charge recites on the surface and electric field inside the shell is zero.

27. (1)

$$\text{as } \frac{g_p}{g_e}=\frac{GM_p}{R_p^2}\times\frac{R_e^2}{GM_e}=\frac{M_p}{M_e}\times\left(\frac{R_e}{R_p}\right)^2$$

$$\Rightarrow g_p=2\times(2)^2\times 10$$

$$g_p=80\text{ms}^{-2}$$

28. (2)

29. (2)

Distance travelled by the body in 'n' (first) second is

$$h=\frac{1}{2}gn^2--(1)$$

Distance travelled by the body in the last 'n' second is

$$\frac{11}{36}h=g\left(n-\frac{1}{2}\right)--(2)$$

On solving equation (1) and (2) we get n= 6 sec

$\therefore$ Distance or height covered h= ½ gn^2 = ½ $\times 10\times 6^2$ = 180 cm

30. (2)

as at the bottom the energy (KE) is 150J means $50J^1$ of energy might have become heat energy will passing through air

31. (4)

Force applied on the ball is $F=\frac{\sqrt{2}mv}{t}=80\sqrt{2}N$

32. (2)

Change in momentum $\Delta P=2mv=2\times 0.1\times 40=8\text{kgms}^{-1}$

$$\therefore F=\frac{\Delta F}{\Delta t}=\frac{8}{0.05}=160N$$

$$\therefore\ a=\frac{F}{M}=\frac{160}{0.05}=1600\text{ms}^{-2}$$

33. (1)

as body stops its final momentum is zero

$$\therefore F=\frac{mv_i}{t}=\frac{0.1\times 40}{0.05}=80N$$

34. (1)

35. (2)

CHEMISTRY

35. (1) Chromium: After removing 4s electron next to be removed is from relatively stable half filled $3d^5$ structure

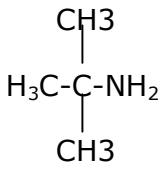
36. (4) $FeO+SiO_2=FeSiO_3$: Slag= gamgus + flux

37. (3)

38. (2)

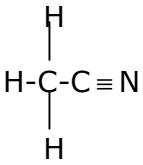
39. (3) : Boiling point depends on number of ionized particles in solution

40. (1) : $CH_3CH_2CH_2CH_2NH_2$, $\begin{matrix}H_3C\\H_3C\end{matrix}>CH-CH_2-NH_2$, $CH_3.CH2.CH\text{-}CH_3$ (with NH_2 branch)



42. (4): $Al^{3+}+3e^- \longrightarrow Al$

43.



44. (3)

45. (4) In option B due to back bonding in Cl_2O in Option D due to increase in size of control atom

46. (2)

47. (3)

48. (1) Limonite $Fe_2O_3.3H_2O$; Chalcocite Cu_2S; Galena Pbs: Azurite $Cu(OH)_2\ 2CuCO_3$

49. (3)

50. (4)

51. (2)

$$\%p=\frac{0.222\times62\times100}{0.31\times222}=20\% \quad Mg_2P_2O_7 \text{ is Magnesium Pyrophosphate}$$

8×10^3 ml water uses $---$ 0.32g

52. (4) 10^6 ml water uses $-----?$

$$=\frac{0.32\times10^6}{8\times10^3}=40\text{ppm}$$

53. (3) Ag=41 atomic number : $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^{10}\,4s^2\,4p^6\,5d^{10}\,5s^1$

54. (2)

[$H_2(g)+ ½\ O_2(g) \longrightarrow H_2O$ (l)

1mol 0.5mol 1mol

Given 10/2=5mol 64/32=2mol 4 mol

55. (4)

$CaO + Ca(HCO_3)_2 \rightarrow 2CaCO_3 + H_2O$

1mol $Ca(HCO_3)_2 = 1$mol $CaO = 2$ mole $CaCO_3$

moles of Bicarbonate in 10^6 liters of water $= 0.01\times10^6 = 10^4$

moles of CaO needs $10^4 \Rightarrow$ weight of CaO needs $= 10^4\times56 = 5.6\times10^5$ g

BIOLOGY

56. (2)

57. (2)

58. (3)

59. (4) In this picture you can see a spirogyra undergoing fragmentation on process

60. (1)

61. (1)

62. (2)

63. (4)

64. (2)

65. (3)

66. (2)

67. (4)

68. (3)

69. (4) Cuttle fish belongs to Mollusca, Crayfish and silver fish belongs to Arthropod. All these phyla have open type of circulatory system.

70. (4)

71. (3)

72. (3)

73. (2)

74. (2)

75. (3)

76. (4)

77. (4) DNA consists of Aolenine, Guanine, Cytosine and Thymine as nitrogen bases whereas RNA consists of Adenine, Uracil, Cytosine and Guanine. Thymine is absent in RNA.

78. (1)

♀ / ♂	B	B
b	Bb	Bb
b	Bb	Bb

From the above checker board, the genotype is Bb and phenotypically all are brown.

79. (4)

80. (3)

MATHEMATICS

Section – A

81. (4) (iii) $2x - 3 < x + 2 \Rightarrow x < 5$

$X + 2 \leq 3x + 5 = 2x \geq -3 \quad X \geq -3/2 \qquad \therefore \frac{3}{2} \leq x < 5 \Rightarrow (iii\ is\ true)$

(i) $\frac{-2}{3} < x + 1 \leq 2/3 = \frac{-5}{3} < x \leq \frac{-1}{3} \Rightarrow (i\ is\ true)$

(ii) $|4 - x| > 3 \Rightarrow 16 - 8x + x^2 > 9$

$\Rightarrow x^2 - 8x + 7 > 0$

$\Rightarrow x^2 - 7x - x + 7 > 0$

$\Rightarrow x(x - 7) - 1(x - 7) > 0$

$\Rightarrow (x - 1)(x - 7) > 0 = x < 1$ (or) $x > 7$ (ii is true)

82. (3) Let $\frac{x-1}{2x+1} = a$ Then $2a^2 - 5a - 12 = 0 \Rightarrow 2a^2 - 8a + 3a - 12 = 0$

$\Rightarrow 2a(a - 4) + 3(a - 4) = 0$

$\Rightarrow (a - 4)(2a + 3) = 0$

$\therefore a = 4$ (or) $-3/2$

Let $a = 4$ then $x - 1 = 4(2x + 1)$

$x - 1 = 8x + 4$

$\Rightarrow 7x = -5$

$\Rightarrow x = \frac{-5}{7}$

Let $a = -3/2$ then

$\Rightarrow 2(x - 1) = -3(2x + 1)$

$\Rightarrow 2x - 2 = -6x - 3$

$\Rightarrow 8x = -1 \Rightarrow x = \frac{-1}{8}$

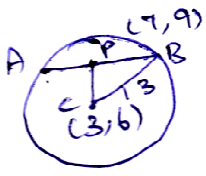
83. (4) By componendo and divedendo $\frac{2\sqrt{a+x}}{2\sqrt{a-x}} = \frac{b+1}{b-1} \Rightarrow \frac{a+x}{a-x} = \frac{(b+1)^2}{(b-1)^2} \Rightarrow$

$$\frac{2a}{2x} = \frac{(b+1)^2 + (b-1)^2}{(b+1)^2 - (b-1)^2}$$

$$\Rightarrow \frac{a}{x} = \frac{2(b^2+1)}{4b}$$

$$\Rightarrow x = \frac{2ab}{1+b^2}$$

84. (4) CP = $\sqrt{16+9}$ = 5 (as distance CP = $\sqrt{(7-3)^2 + (9-6)^2}$)



$\therefore$ PB = 12 Units ($\because CP^2 + PB^2 = CB^2$)

$\therefore$ Length of chord = AB= 24 Units (AP=PB)

85. (3) $f(1) = 3 \Rightarrow 3 - m + n = 3 \Rightarrow m = n$

f(-2) = 9 $\Rightarrow 3(-2)^2 - m(-2) + m = 9$

$\Rightarrow$ 12 + 3m = 9

$\Rightarrow$m = -1 $\quad\therefore$ n = -1

86. (2) m = $\frac{-a}{b} \Rightarrow$ m = 2/3 $\quad\therefore$ y = 2/3 x + 4

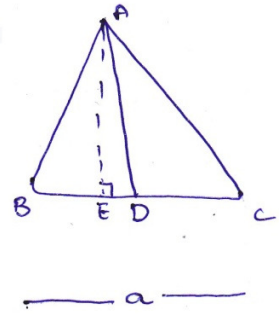
put y = 0 $\quad\Rightarrow \frac{2}{3}x = -4$

$\therefore$ X = -6. $\quad\therefore$ x intercept (-6, 0)

87. (2) BE = EC = a/2, AE = $\frac{\sqrt{3}}{2}a$

BD = $\frac{2a}{3}$, DC = $\frac{a}{3}$ $\quad\because$ BD = BE + ED$\Rightarrow ED = \frac{2a}{3} - \frac{a}{2}$

$\Rightarrow$ ED = $\frac{4a-3a}{6}$ = a/6



From ΔAED

$\therefore (AD)^2 = (AE)^2 + (ED)^2$

$= \frac{3a^2}{4} + \frac{a^2}{36}$

$= \frac{27a^2 + a^2}{36} = \frac{28a^2}{36}$ $\quad\Rightarrow AD^2 = \frac{7a^2}{9}$

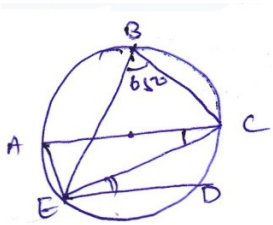
(Given $AD^2 = K \times AB^2$) $\Rightarrow \frac{7a^2}{9} = K\,a^2 \Rightarrow K = \frac{7}{9}$

88. (1) Both the statements are true.

89. (3) $\angle EBC = \angle EAC = 65^0$ $(Angles\ in\ same\ segment)$

$\angle ACE = 180^0 - (65^0 + 90^0) = 25^0$

$\Rightarrow \angle CED = 25^0$



90. (4) $n \times \pi \times d = 8800000 = n \times \frac{22}{7} \times 56 = 880000$

$\Rightarrow$ n = 50, 000

91. (1) Volume of Earth (Volume of Cylinder) = $\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{225}{10} = \frac{3465}{4}$

Cost of earth $\frac{3465}{4} \times 8$ = 6930 Rs.

(C.S.A of cylinder) $\quad 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{225}{10} = 495 Rs.$

Cost of painting = 495 x 14 = 6930 Rs.

$\therefore$ over all cost is 6930 – 6930 = 0

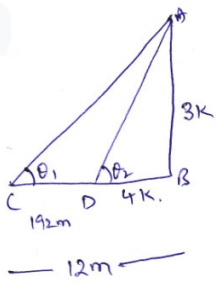
92. (3)

$$\sec\theta+\tan\theta=p$$
$$\sec\theta-\tan\theta=1/p$$
$$2\sec\theta=\frac{p^2+1}{p}=\sec\theta=\frac{p^2+1}{2p}$$

$$\sec\theta+\tan\theta=p$$
$$\sec\theta-\tan\theta=1/p$$
$$2\tan\theta=\frac{p^2-1}{p}$$
$$\tan\theta=\frac{p^2-1}{2p}$$

$$\sin\theta=\cos\theta\tan\theta$$
$$=\frac{2p}{Hp^2}\times\frac{p^2-1}{2p}$$
$$=\frac{p^2-1}{p^2+1}$$

93. (4) 3K = 5m $\Rightarrow$m = $\frac{3K}{5}$



4K+192 = 12m $\Rightarrow$4K + 192 = 12 x $\frac{3K}{5}$ $\Rightarrow$192 = $\frac{36K}{5}-4K$

192 = $\frac{16K}{5}\Rightarrow$K = 60 $\Rightarrow$m = $\frac{3}{5}\times60=36$ $\therefore ht\ of\ tower=180m$

94.(4) $\frac{1+7+5+3+4+4}{6}=\frac{24}{6}=4=m$ (Mean)

$\frac{2+2+3+3+3+4+P}{7}=3\Rightarrow$ 17 + P = 21$\Rightarrow$P = 4

Median is obtained by arranging in ascending order

2, 2, 3, 3, 3, 4, 4 $\Rightarrow$median = q = 3

95. (3) $I=\frac{P\times T\times R}{100}$ From the option (P=8000 and R=10% and T for every one year)

(I yr) $\frac{8000\times1\times10}{100}=800$ (II yr) $\frac{8800\times1\times10}{100}=880$ (III yr) $\frac{9680\times1\times10}{100}=968$Rs.

Section: B

96. (1): Most likely is the maximum number of times a number (exceeding 12) can be repeated, clearly that
the number is 13 as it can be reached from 12,11,10,9,8, where as 14 onwards cannot be reached from 8.

97. (2): $\left[\frac{1.2.4+2.4.8+3.6.12+....}{1.3.9+2.6.18+3.9+27+....}\right]^{\frac{1}{3}}=\left[\frac{1.2.4(1^3+2^3+3^3....)}{1.3.9(1^3+2^3+3^3....)}\right]^{\frac{1}{3}}=2/3$

98. (4): All roots are real and positive , sum of roots is 20 and products of roots is 1.

is possible when all roots are '1'

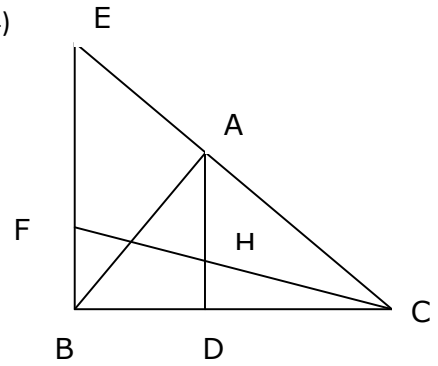
from Vieta's theorem AM=GM if and only if all numbers are equal.

$\therefore$ All roots are equal, A.M. is 1, G.M. is 1

99. (3) : x+(x+7)+(x+14)+(x+21)+(x+28)+(x+35)+(x+42) = 13524

$\Rightarrow$ 7x+147=13524 $\Rightarrow$ 7x=13377 $\Rightarrow$ x=1911

100. (4)



(Draw BE parallel to AD extend AC to E to meet BE) A is the midpoint of CE and F is the midpoint of BE.

AB and CF are medians of Δ CBE

$\therefore$ Ratio is 1:2 (Point of concurrence of medians)

101. (1): ¼ $\times$20=5

20$\longrightarrow$10+10

10$\longrightarrow$ 5+5

$10_{12}=12_{10}$ base 12 system $\therefore$ 1/5 $\times$10 = 2 2/5

102. (4) Let $6x+28=a^3$, $6x-28=b^3$ $8=c^3$

$$(6x+28)^{\frac{1}{3}}-(6x-28)^{\frac{1}{3}}=2\Rightarrow(6x+28)^{\frac{1}{3}}-(6x-28)^{\frac{1}{3}}-8^{1/3}=0$$

103. (4) :

$$x+y+z+u=5\ \ -(1)$$
$$y+z+u+v=1-(2)$$
$$z+u+v+x=2-(3)$$
$$u+v+x+y=0\ \ -(4)$$
$$v+x+y+z-4-(5)$$

$(1)\ \&(5)\quad u-v=1\quad$ and $(2)\ \&\ (3)\ x-y=1$ from $(3)\ \&\ (4)$ using $u-v=1$

We have $v+x=0$

adding all the Equations $x+y+z+u+v=3$

$\Rightarrow\qquad u=-1, v=-2$ and $x=2$

104. (2) a+b+c=0 abc=-r ab+bc+ca=q

$a^3+b^3+c^3=3abc\qquad \dfrac{ab+bc+ca}{abc}=\dfrac{-q}{r}$

$$\Rightarrow\quad \frac{1}{c}+\frac{1}{a}+\frac{1}{b}=-\frac{q}{r}$$

required roots are negative reciprocals of the given equation

$\therefore$ required equation is $rx^3-qx^2-1=0$

105. (3) Only order of the cards drawn is required

The probability of drawing any five numbers is 5!=120

Increasing order of magnitude is possible only in one way. n(E)=1 $\qquad\therefore\ P(E)=\dfrac{n(E)}{n(S)}=\dfrac{1}{120}$