SOLUTIONS & ANSWERS FOR AIEEE-2011 [11-05-2011]
VERSION – A

PART A – CHEMISTRY

1. Ans: Ozone absorbs infrared radiation

Sol: Ozone does not absorb I.R radiation

2. Ans: $(P_A / P_B)(M_B / M_A)^{1/2}$

Sol: $r_A \propto P_A \frac{1}{\sqrt{M_A}}$

$\frac{r_A}{r_B} = \frac{P_A}{P_B}\sqrt{\frac{M_B}{M_A}}$

3. Ans: $RS^{(-)}$ is less basic but more nucleophilic than $RO^{(-)}$

Sol: Since RSH is more acidic than ROH, $RS^{(-)}$ will be less basic than $RO^{(-)}$. Since the negative charge on sulphur is more polarisable, $RS^{(-)}$ is more nucleophilic than $RO^{(-)}$

4. Ans: mutarotation

Sol: It is the definition of mutarotation

5. Ans: 5.55×10^{-4} m

Sol: $m = \frac{0.01}{60 \times 0.3} = 5.55 \times 10^{-4}$ m

6. Ans: directly proportional to square root of temperature

Sol: $V \propto \sqrt{\frac{T}{M}}$

7. Ans: D > C > A > B

Sol: p–nitrophenol is the most acidic among the given phenols.

8. Ans: –1364.0 kJ

Sol: $\Delta H = \Delta U + \Delta nRT$
$-1366.5 = \Delta H - 8.314 \times 10^{-3} \times 300$
$\Delta H = -1364$ kJ

9. Ans: HCHO

Sol: The monomers of bakelite are phenol and formaldehyde.

10. Ans: 2–Methyl–2–pentene

Sol: $CH_3-C(CH_3)=CH-CH_2-CH_3 \xrightarrow{\text{ozonolysis}} CH_3-C(=O)-CH_3 + CH_3-CH_2-CHO$

11. Ans: –219 kJ

Sol: $\Delta_r H = -111 - 2 \times 54$ kJ
$= -219$ kJ

12. Ans: 1×10^{-10}

Sol: $[H^+] = C\alpha$
$\alpha = 10^{-5}$
$K_a = C\alpha^2 = 10^{-10}$

13. Ans: Cl > F > Br > I

Sol: The electron gain enthalpies of I, Br, F & Cl are –295, –325, –328 & –349 kJ mol^{-1}

14. Ans: n = 2 to n = 1

Sol: At. no. of H = 1 and He = 2
For He^+ n = 4 to n = 2
For H $n = \frac{4}{2}$ to $n = \frac{2}{2}$

15. Ans: 68.4

Sol: $\frac{5}{342} = \frac{1}{w}$
w = 68.4

16. Ans: For lead +2, for tin +4

Sol: Pb^{+2} is more stable than Pb^{+4}, since $\Delta_r G°$ is negative.
Sn^{+4} is more stable than Sn^{+2}, since $\Delta_r G°$ is positive.

17. Ans: $\sqrt[4]{1.6 \times 10^{-30} / 27}$

Sol: $K_{sp} = 27S^4$
$S = \sqrt[4]{\frac{K_{sp}}{27}}$

18. Ans: $Li_2O + NO_2 + O_2$

Sol: $4LiNO_3 \rightarrow 2Li_2O + 4NO_2 + O_2$

19. Ans: 6.25×10^{-4} S m^2 mol^{-1}

Sol: $K = C \times \frac{l}{a}$

$\frac{l}{a} = 1.3 \times 50$ S m^{-1}

$\wedge = C \times \frac{l}{a} \times \frac{10^{-3}}{M}$

$= \frac{1}{260} \times 1.3 \times 50 \times \frac{10^{-3}}{0.4}$

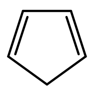
$= 6.25 \times 10^{-4}$ S m^2 mol^{-1}

20. Ans: $NH_3 < en < CN^- < CO$

Sol: The correct increasing order of field strength for the ligands is
$NH_3 < en < CN^- < CO$

21. Ans: Acetylene

Sol: Acetylene is not formed by treating ethanol with con.H_2SO_4.

22. Ans: 

Sol: Cyclopentadiene is not aromatic.

23. Ans: One sigma, two pi

Sol: Ca^{2+} $\quad \bar{C} \equiv \bar{C}$

24. Ans: $k_1 = A\,k_2 - e^{Ea_1/RT}$

Sol: $k_1 = A_1 e^{-Ea_1/RT}$

$k_2 = A_2 e^{-Ea_2/RT}$

$\frac{k_1}{k_2} = \frac{A_1}{A_2} - e^{\frac{Ea_2 - Ea_1}{RT}}$

$k_1 = A\,k_2 - e^{Ea_1/RT}$

25. Ans: 128 pm

Sol: $\sqrt{2}\,a = 4r$

$r = \frac{\sqrt{2} \times 361}{4} = 128$ pm

26. Ans: 22.05 g

Sol: $Cr_2O_7^{2-} + 6Fe^{2+} \rightarrow Cr^{3+} + Fe^{3+}$

75 750 cm^3
m.mols 0.6 M
Wt. of potassium dichromate = 75×0.294
= 22.05 g

27. Ans: Oxide ion accepts sharing in a pair of electrons

Sol: O^{2-} becomes OH^- by sharing a pair of 2 electrons between hydrogen & oxygen.

28. Ans: XeF_2

Sol:

Compound	Lone pairs
XeF_4	2
XeF_6	1
XeF_2	3
XeO_3	1

29. Ans: Benzene diazonium chloride and benzonitrile

Sol: A : $C_6H_5\overset{+}{N}_2\overset{-}{Cl}$
B : $C_6H_5 - CN$

30. Ans: $[Co(NH_3)_2(en)_2]^{3+}$

Sol: $[Co(NH_3)_2(en)_2]^{3+}$ exists in cis & trans isomers.

PART B – PHYSICS

31. Ans: $\frac{1}{\sqrt{t}}$

Sol: u = 0 at t = 0

$\frac{1}{2}mv^2 = kt$

$\Rightarrow v^2 = \frac{2kt}{m}$, k = +ve constant

$\Rightarrow v = \sqrt{\frac{2kt}{m}}$

$a = \frac{dv}{dt} = \frac{B}{\sqrt{E}} \Rightarrow F = ma \propto \frac{1}{\sqrt{t}}$

32. Ans: 2 : 1

Sol: $I_P = 4I$

$I_Q = I + I + 2I\cos 90°$

$= 2I$

$\therefore \frac{I_P}{I_Q} = \frac{4I}{2I} = 2 : 1$

(Path difference $\frac{\lambda}{4}$

= phase difference $\frac{\pi}{2}$ rad)

33. Ans: $\sqrt{\frac{GM}{4R}}$

Sol: $\frac{mv^2}{R} = \frac{Gm^2}{4R^2}$

$v = \sqrt{\frac{GM}{4R}}$ w.r.t centre of circle, which also is centre of mass of system.

Centre of mass of system is at rest.

34. Ans: 3

Sol: It is assumed that F_1 and F_2 are applied parallel to the plane.

$F_1 = mg\sin\theta + \mu mg\cos\theta$

$F_2 = mg\sin\theta - \mu mg\cos\theta$

$$\frac{F_1}{F_2} = \frac{\tan\theta+\mu}{\tan\theta-\mu} = \frac{2\mu+\mu}{2\mu-\mu} = \frac{3}{1}$$

35. Ans: 5%

Sol: $R_S = 4\,R$

$\therefore \Delta R_S = 4\Delta R$

$$\Rightarrow \frac{\Delta R_S}{R_S} = \frac{40\ R}{4\ R} = \frac{\Delta R}{R} = 5\%$$

36. Ans: 11q

Sol: $\overline{F} = q\overline{E} + q\left(\overline{v}\times\overline{B}\right)$

$= \left(3q\hat{i} + q\hat{j} + 2q\hat{k}\right)$

$+ q\left(3\hat{i} + 4\hat{j} + \hat{k}\right)\left(\hat{i} + \hat{j} - 3\hat{k}\right)$

$\left|\overline{F}_y = q\hat{j} + \left(9q\hat{j} + q\hat{j}\right)\right| = 11q\hat{j}$

37. Ans: $0.1\ V\ m^{-1}$

Sol: $R = \frac{\rho\lambda}{A}$; $V = iR$

$V = \frac{i\rho\lambda}{A} \Rightarrow \frac{V}{\lambda} = \frac{i\rho}{A}$

$$\therefore \frac{V}{\lambda} = \frac{0.2\times4\times10^{-7}}{8\times10^{-7}}$$

$= 0.1\ V\ m^{-1}$

38. Ans: $\frac{\sqrt{3}}{16}\frac{mv^3}{g}$

Sol: $v_H = v\cos30° = \frac{\sqrt{3}\,v}{2}$

$p = mv_H = \frac{\sqrt{3}}{2}mv$

$$H_{max} = \frac{v^2\sin^2 30°}{2g} = \frac{v^2}{8g}$$

$$\therefore L_H = p\,H_{max} = \frac{\sqrt{3}\,mv^3}{16\,g}$$

39. Ans: between 0.148 kJ and 0.028 kJ

Sol: $dQ = -mS\,dT$

$$= -\frac{100}{1000}\times\frac{32\,T^3}{(400)^3}\,dT\,(kJ)$$

$$= -\frac{1}{10}\times\frac{32}{64\times10^6}\,T^3\,dT$$

$$= -\frac{1}{2\times10^7}\,T^3\,dT\ (kJ)$$

$$\therefore Q = \int_{20K}^{4K} dQ = \int_{20}^{4}\frac{-T^3dT}{2\times10^7}\,kJ = \left.\frac{T^4}{8\times10^7}\right]_4^{20}$$

$$= \frac{\left|20^4-4^4\right|}{8\times10^7}\,kJ = 19968\times10^{-7}\ kJ$$

$= 0.0019968\ kJ$

$$COP = \frac{Q}{W} = \frac{T_2}{(T_1-T_2)} \Rightarrow W = \frac{Q(T_1-T_2)}{T_2}$$

$$W_{max} = \frac{0.0019968\times(300-4)}{4}$$

$= 0.148\ kJ$

$$W_{min} = \frac{0.0019968\times(300-20)}{20}$$

$= 0.028\ kJ$

40. Ans: $2\pi\sqrt{\frac{\lambda d}{\rho g}}$

Sol: $m = \lambda^3 d$

$\Delta F = -\lambda^2\rho gx$

$\therefore a = \frac{\Delta F}{m} = \frac{-\rho gx}{\lambda d}$

$\Rightarrow \omega^2 = \frac{\rho g}{\lambda d}$

$T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{\lambda d}{\rho g}}$

41. Ans: $\frac{P}{2}, T$

Sol: There is no heat loss and no work is done

$\Rightarrow$ U is same $\Rightarrow$ T is same.

$V \Rightarrow 2\,V$, so $P \Rightarrow \frac{P}{2}$ for T to be same

($\because$ PV = constant for T to be constant)

$\therefore \frac{P}{2}, T$ is the final state.

42. Ans: 2

Sol: $I_1 = 4I$, for coherent light

$I_2 = I + I = 2I$ for incoherent light

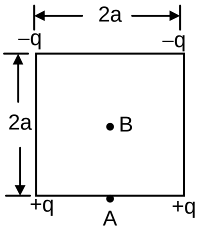
$$\therefore \frac{I_1}{I_2} = \frac{4I}{2I} = 2$$

43. Ans: NOR gate

Sol: Becomes combination of OR gate and NOT gate
$\Rightarrow$ NOR gate

44. Ans: $\frac{1}{4\pi\varepsilon_0}\frac{2qQ}{a}\left[1-\frac{1}{\sqrt{5}}\right]$

Sol:



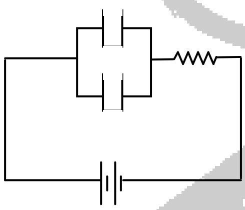
$V_A = \frac{2q}{4\pi\varepsilon_0 a} - \frac{2q}{4\pi\varepsilon_0\sqrt{5}a} = \frac{2q}{4\pi\varepsilon_0 a}\left[1-\frac{1}{\sqrt{5}}\right]$

$\therefore U_1 = \frac{2qQ}{4\pi\varepsilon_0}\left[1-\frac{1}{\sqrt{5}}\right]$; $V_B = 0 \Rightarrow U_2 = 0$

$\therefore KE_2 = \Delta U = U_1 = \frac{2qQ}{4\pi\varepsilon_0 a}\left[1-\frac{1}{\sqrt{5}}\right]$

45. Ans: 2.5 second

Sol:



$\tau_P = RC' = 2\ RC$

$V = V_0 e^{-\frac{t}{\tau_P}}$

$\Rightarrow \frac{1}{2} = e^{-\frac{10}{\tau_P}}$

$\Rightarrow -\lambda n\ 2 = \frac{-10}{\tau_P}$

$\Rightarrow \tau_P = \frac{-10}{-\lambda n2} = \frac{10}{\lambda n2} = 2\ RC$

$\tau_S = RC'' = \frac{RC}{2} = \frac{2RC}{4} = \frac{5}{2\lambda n2}$

$\Rightarrow \frac{1}{2} = e^{-\frac{t}{\tau_S}} \Rightarrow -\lambda n2 = -\frac{t \times 2\lambda n2}{5}$

$\Rightarrow t = \frac{5}{2} = 2.5$ s $\Rightarrow$ t = 2.5 second

46. Ans: $\left(1-\frac{1}{\mu_1}\right)h_1 + \left(1-\frac{1}{\mu_2}\right)h_2$

Sol: $S = S_1 + S_2$

$= \left(1-\frac{1}{\mu_1}\right)h_1 + \left(1-\frac{1}{\mu_2}\right)h_2$

47. Ans: $Y \propto t$

Sol: Thermal stress = $Y \propto t$

48. Ans: A standing wave having nodes at
$x = \left(n+\frac{1}{2}\right)\frac{\lambda}{2}$, (n = 0, 1, 2, …..)

Sol: $y_1 = A \sin(\omega t - kx)$
$y_2 = A \sin(\omega t + kx)$
$y = y_1 + y_2$
$= A\,[2 \sin\omega t \cos(-kx)]$
$= 2A \cos kx \sin\omega t \Rightarrow$ standing wave;
$k = \frac{2\pi}{\lambda}$ Nodes are at
$x = \left(n+\frac{1}{2}\right)\frac{\lambda}{2}$, (n = 0, 1, 2, …..)

49. Ans: $\frac{\pi R^4}{4}\sigma\omega$

Sol: $dq = (2\pi r dr)\sigma$ for an elemental ring of radius r and width dr.
$di = (dq)f = \frac{(dq)\omega}{2\pi} = \omega r\sigma dr$
$dM = \pi r^2 di = \pi\omega\sigma r^3 dr$
$\therefore M = \int_0^R dM = \frac{\pi\omega\sigma R^4}{4}$

50. Ans: 28.9 cc

Sol: $\Delta V = V_0\gamma\Delta\theta$
$= V_0\,[3 \propto \Delta\theta]$
$= \frac{\pi}{6}D^3[3 \propto \Delta\theta]$
$= \frac{\pi}{6}\times 20^3\,[3 \times 23 \times 10^{-6} \times 100]$
$= 28.9\ cm^3$

51. Ans: $2^{8/3}\pi r^2\ T$

Sol: $R = 2^{1/3}\ r$
$E = 4\pi R^2 T$
$= 2^2.\pi.2^{2/3}.r^2\ T$
$= 2^{8/3}\pi r^2\ T$

52. Ans: $6.25 \times 10^{-4}\ cm\ s^{-1}$

Sol: $v = \frac{2r^2 g(\rho-\sigma)}{9\eta}$

$$\frac{v_2}{v_1} = \frac{\eta_1}{\eta_2}\frac{(7.8-1.2)}{(7.8-1.0)}$$

$$\Rightarrow v_2 = v_1\frac{\eta_1}{\eta_2}\times\frac{6.6}{6.8}$$

$$= \frac{10\times8.5\times10^{-4}}{13.2}\times\frac{6.6}{6.8} = 6.25\times10^{-4}\text{ cm s}^{-1}$$

53. Ans: 3 mV

Sol: $\lambda = 20$ m
$v = 5$ m s^{-1}
$B_h = 0.3\times10^{-4}$ Wb m^{-2}
$\mathcal{E} = B_h v\lambda$
$= 0.3\times10^{-4}\times5\times20 = 0.3\times10^{-2}$ V
$= 3$ mV

54. Ans: λ

Sol: Considering the nucleus to be at rest initially, total linear momentum = zero for system
$\Rightarrow$ p of m_1 and p of 5 m, are equal in magnitude but opposite in direction.
$\lambda = \frac{h}{p}$ = same for both

55. Ans: To reduce the time lag between transmission and reception of the information signal.

56. Ans: $\frac{5}{2}k$

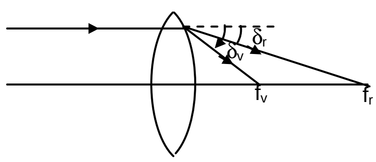
Sol: $k \propto \frac{1}{N} \propto \frac{1}{\lambda}$
$\Rightarrow k\lambda$ = constant
$k_A\lambda_A = k\lambda$
$\Rightarrow k_A = \frac{k\lambda}{\lambda_A} = k\frac{5\lambda}{2\lambda} = \frac{5k}{2}$

57. Ans: Statement – 1 is correct, statement – 2 is correct and statement – 2 is not the correct explanation of statement-1.

Sol: Statement – 1 is correct as energy of antineutrino is negligible.
Statement – 2 is also correct but does not explain-1.

58. Ans: Increase

Sol:



$f_r > f_v$

59. Ans: Statement – 1 is true, statement – 2 is true, statement – 2 is the correct explanation of statement – 1.

Sol: Statement – 1 is true, statement – 2 is true and explain 1.

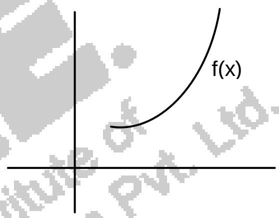
60. Ans: Statement – 1 is true, statement – 2 is true, statement – 2 is not the correct explanation of statement – 1.

Sol: Statement – 1 is correct. Statement 2 is correct but doest not explain 1.

PART C – MATHEMATICS

61. Ans: Statement-1 is true, Statement-2 is true; statement-2 is a correct explanation for statement-1.

Sol: $f(x) = f^{-1}(x)$, this point lies on $f(x) = x$
$\Leftrightarrow f(x) = x$
$(x-1)^2 + 1 = x \Rightarrow x^2 - 3x + 2 = 0$
$\Rightarrow x = 1, 2$
Statement-1 is true
f(x) is a bijection and $f^{-1}(x) = 1 + \sqrt{x-1}$
Statement 2 is true
and Statement-1 follows from Statement-2



62. Ans: H

Sol: $H = \begin{bmatrix}\omega & 0\\ 0 & \omega\end{bmatrix} = \omega I$
$\therefore H^{70} = \omega^{70} I = \omega I = H$

63. Ans: $\frac{3}{4}$

Sol:

$$\int_0^{1.5} x\left[x^2\right]dx = \int_0^1 x\times0\,dx + \int_1^{\sqrt2} x\,dx + \int_{\sqrt2}^{1.5} 2x + dx$$

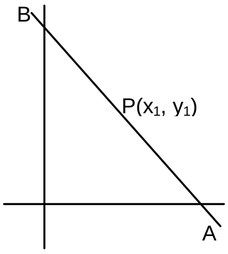
$$= \frac{x^2}{2}\Big|_1^{\sqrt2} + x^2\Big|_{\sqrt2}^{1.5}$$

$$= \frac{1}{2} + 2.25 - 2$$

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

64. Ans: $y = \frac{6}{4}$

Sol:



Let m be the slope of taught at $P(x_1, y_1)$

$\therefore$ Equation of AB is

$y - y_1 = m(x - x_1)$

$\therefore$ A is $(0\ y_1 - mx_1)$ and B is $(x_1\ \frac{-y_1}{m}, 8)$

$\therefore$ and point of AB (x_1, y_1)

$\Rightarrow 2x_1 = x_1 - \frac{y_1}{m} \Rightarrow \frac{dx}{x} + \frac{dy}{y} = 0$

$\Rightarrow$ xy = k it passes in (2, 3)

$xy = 6 \Rightarrow y = \frac{6}{4}$

65. Ans: 32, 2

Sol: Mean = 30 + 2 = 32

Standard deviation remains same = 2

66. Ans: $[1, \infty)$

Sol: $x + y\ |x|,\ ax - y = 1$

$x = \frac{|a|+1}{a+1},\ y = |a| - \frac{|a|+1}{a+1}$

$= \frac{a|a|-1}{a+1}$

If $x > 0 \Rightarrow a + 1 > 0 \Rightarrow a > -1$

$y > 0 \Rightarrow a|a| - 1 > 0 \Rightarrow a|a| > 1$

If $-1 < a < 0 - a^2 > 1$ no soln

If $a \geq 0$

$a^2 \geq 1 \Rightarrow |a| \geq 1$

$\therefore a \in [1, \infty)$

67. Ans: – 2

Sol: $\begin{vmatrix} p & 1 & 1 \\ 1 & q & 1 \\ 1 & 1 & r \end{vmatrix} = 0 \Rightarrow pqr - (p + q + r) = -2$

68. Ans: $10\sqrt{3}$

Sol: Equation of the lime through (1, – 5, 9) parallel to x = y = 12 is

$\frac{x-1}{1} = \frac{y+5}{1} = \frac{z-9}{1} = \lambda$

$p(\lambda + 1, \lambda - 5, \lambda + 9)$

$(\lambda + 1) - (\lambda - 5) + (\lambda + 9) = 5$

$\Rightarrow \lambda = -10$

$\therefore$ p(– 9, –15, – 1)

$\therefore$ distance = $10\sqrt{3}$

69. Ans: $\overset{\rho}{0}$

Sol: $(a + 3b) + 6c = (k_1 + 6)\ c = (1 + 3k_2)a$

C & a are non – collinear

$\therefore$ coefficients are zero

a + 3b + 6c = 0

70. Ans: 2x + 3y =1

Sol: Let (x, y) be coordinates of centroid

$x = \frac{2-2+x_3}{3}$ $\qquad y = \frac{-3+1+y_3}{3}$

$= \frac{x_3}{3}$ $\qquad = \frac{2-y_3}{3}$

$x_3 = 3x$ $\qquad y_3 = 3Y + 2$

$2x_3 + 3y_3 = 9 \Rightarrow 6x + 9y + 6 = 9$

2x + 3y = 1

71. Ans: $N \leq 100$

Sol: Maximum number of triangles are possible if rest of the points are non-collinear.

Then $N_{max} = {}^{10}C_3 - {}^{6}C_3 = 100$

$\therefore N \leq 100$

72. Ans: Statement-1 is true, statement-2 is false

Sol: $\lim_{x \to 0} \sin\frac{1}{x}$ does not exist

$\therefore f_2(x)$ is not continuous at x = 0

Statement-2 is false

73. Ans: Statement-1 is true, Statement-2 is true; statement-2 is a correct explanation for statement-1.

Sol: Statement-2

By induction p(1) is true

Let p(m) be true

Then $(m + 1) : (m + 1)^7 - (m + 1)$

$= m^7 + {}^7C_1, m^6 + \ldots.. + 7m + 1 - m - 1$

$= (m^7 - m) + 7k$ divisible by 7

$\therefore$ p(n) is true

Statement-2 is true

$\therefore (n + 1^7 - (n + 1)$ divisible by 7

Also, $n^7 - n$ divisibly by 7

Subtracting, $(n + 1)^7 - n^7 - 1$ divisible by 7

Statement-1 is true and follows from Statement-2

74. Ans: $x^2 + y^2 - x - y = 0$

Sol: $(x - 1)\ x + y\ (y - 1) = 0$

$x^2 + y^2 - x - y = 0$

75. Ans: $3x^2 - y^2 = 3$

Sol: e = 2

$ae = 2 \Rightarrow a = 1$

$e = \sqrt{1+\frac{b^2}{a^2}} \Rightarrow b^2 = 3$

$\therefore$ required equation is $x^2 - \frac{y^2}{3} = 1$

$3x^2 - y^2 = 3$

76. Ans: R – {2, –3}

Sol: $\begin{vmatrix} 1 & -k & 1 \\ k & 3 & -k \\ 3 & 1 & -1 \end{vmatrix} \neq 0$

$2k^2 + 2k - 12 \neq 0$
$k^2 + k - 6 \neq 0$
$k \neq -3, 2$

77. Ans: 6, 1

Sol: Sum of roots = 4 + 3 = 7
product = $3 \times 2 = 6$
$\therefore$ correct equation is $x^2 - 7x + 6 = 0$
Roots are 6, 1

78. Ans: $\frac{\alpha-\beta}{100}$

Sol: $\alpha - \beta = \sum_{1}^{100}(a_{2r} - a_{2r-1})$

$= \sum_{1}^{100} d = 100\,d \Rightarrow d = \frac{\alpha-\beta}{100}$

79. Ans: $1 + \frac{1}{y} - \frac{e^{1/y}}{e}$

Sol: $y^2dx + xdy - \frac{1}{y}dy = 0$

$\Rightarrow \frac{dx}{dy} + n.\frac{1}{y^2} = \frac{1}{y^3}$

I. F = $e^{-1/y}$

$\therefore x e^{-1/y} = \int \frac{1}{y^3} e^{-1/y} dy$ $\quad z = \frac{1}{y}$

$\int z.e^{-z} - dy$ $\quad d_z = \frac{-1}{y^2}dy$

$-\left[ze^{-z} + \int e^{-z}dz\right]$ $\quad dy = y^2dz$

$x e^{-1/y} = ze^{-z} + e^{-z} + C$

$x = z + 1 + c\,e^{-1/y}$

$x = \frac{1}{y} + 1 + c\,e^{1/y}$

$y = 1 \Rightarrow x = 1 \Rightarrow 1 = 2 + ce$

$\Rightarrow c = -\frac{1}{e}$

$\therefore x = \frac{1}{y} + 1 - -\frac{1}{e}\ e^{1/y}$

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

80. Ans: 3

Sol: $\lim_{x\to5} \frac{(f(x))^2 - 9}{\sqrt{1x-51}} = 0$

$\lim_{x\to5} \frac{(f(x))^2 - 9}{\sqrt{x-5}} = 0$

$\lim_{x\to5} (f(x))^2 - 9 = 0$

$\lim_{x\to5} f(x) = 3$

81. Ans: Statement-1 is true and Statement-2 is false.

Sol: Statement-1 is true
In Statement-2
Det (A^T) = det(A) But
Det(–A) = – Det (A) only for
odd order so it is not true.

82. Ans: $\frac{2\pi}{9}, \frac{\pi}{4}, \frac{4\pi}{9}, \frac{\pi}{2}, \frac{3\pi}{4}, \frac{8\pi}{9}$

Sol: $\sin\theta + \sin 4\theta + \sin 7\theta = 0$
$\Rightarrow \sin 4\theta + 2\sin 4\theta \cos 3\theta = 0$
$\Rightarrow \sin 4\theta (1 + 2\cos 3\theta) = 0$
$\Rightarrow \sin 4\theta = 0 \cos 3\theta = -\frac{1}{2} = \cos\frac{2\pi}{3}$

$\Rightarrow 4\theta = n\pi$ $\quad 3\theta = 2n\pi \pm \frac{2\pi}{3}$

$\Rightarrow \theta = \frac{n\pi}{4}, \theta = \frac{2n\pi}{3} \pm \frac{2\pi}{9}$

$\frac{\pi}{2}, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{8\pi}{9}, \frac{4\pi}{9}, \frac{2\pi}{9}$

83. Ans: $\frac{16}{3}$

Sol: $y^2 = 9\,ax$
$x^2 = 9by$
$A = \frac{16}{3}ab = \frac{1}{3}$

$\therefore$ Required Area = $\frac{16}{3}$

84. Ans: Statement-1 is true, Statement-2 is true; statement-2 is a correct explanation for statement-1.

Sol: Statement- 2 is true
Clearly f(x) has minimum at x = 0 at minimum point f'(x) = 0
$\therefore$ follows from 1

85. Ans: $[A \wedge (A \rightarrow B)] \rightarrow B$

Sol: Using following truth table we can see that only
$A \wedge (A \rightarrow B) \rightarrow B$ is tautology

A 1	B 2	$A \rightarrow B$ 3	$A \cap (A \rightarrow B)$ $1 \cap 3 = 4$	$(A \cap (A \rightarrow B)) \rightarrow B$ $4 \rightarrow 2$
T	T	T	T	T
T	F	F	T	T
F	T	T	F	T
F	F	T	F	T

86. Ans: $P(A^C) - P(B)$

Sol: $P\left(A^C \cap B^C / C\right)$

$= \dfrac{P(C) - P(B \cap C) - P(A \cap C)}{P(C)}$

$= 1 - P(B) - P(A)$
$= 1 - P(A) - P(B)$
$= P(A^C) - P(B)$

87. Ans: 18

Sol: $P(x) = f(x) - g(x) = A x^2 + Bx + C$
Since P–1) = 0 is the only one root
$\therefore P(x) = k(x + 1)^2$
Given $P(-2) = 2 \Rightarrow k = 2$
$\therefore P(2) = 18$

88. Ans: $\sqrt{53}$

Sol: General point on line Q $(2\lambda, 3\lambda + 2, 4\lambda + 3)$
$\Rightarrow 2(2\lambda - 3) + 3(3\lambda + 3) + 4(4\lambda - 8) = 0$
$\Rightarrow \lambda = 1$
$\therefore$ point Q (2, 5, 7) given point P (3, –1, 11)
$\therefore$ length PQ = $\sqrt{53}$

89. Ans: Statement-1 is true, Statement-2 is true; statement-2 is a correct explanation for statement-1.

Sol: R is an equivalence relation since reflexivity, symmetry, transitivity are satisfied. $\therefore$ Statement-1 is true
Statement-2 is always true
And it is correct explanation of Statement-1

90. Ans: $2af(a) - a^2 f'(a)$

Sol: $\lim\limits_{x \to a} \dfrac{x^2 f(a) - a^2 f(x)}{x - a}$ $\quad \left(\dfrac{0}{0}\right)$

$\lim\limits_{x \to a} f(a)2x - a^2 f'(x)$
$\Rightarrow 2af(a) - a^2 f'(a)$