HINTS & SOLUTIONS

PART-A : PHYSICS

1. Light of.....

Sol. $\frac{2\lambda D}{a} = \frac{2\times 600\times 10^{-9}\times 2}{4\times 10^{-4}} = 0.06$ m

2. In a stack.....

Sol. $I_1 = I_0\cos^2\theta = \frac{I_0}{2}$

$I_2 = I_1\cos^2\theta = \frac{I_0}{4}$

$I_3 = I_2\cos^2\theta = \frac{I_0}{8}$

3. In a compound.....

Sol. M.P. $= \frac{V_0}{V_0}\left(\frac{D}{f_e}\right)$

4. For the.....

Sol. $V = x\ell_1$

$V \propto \ell$

5. You are.....

Sol. $20 \to 40$

$\frac{3f}{2} \to 3f \Rightarrow f = \frac{40}{3}$

Case (2) $f = \frac{20}{3}$

Now object distance = 3F

so image at = 3F/2 at 10 cm from lens on right side.

6. A free.....

Sol. From momentum conservation

$\frac{h}{\lambda_{Photon}} = \sqrt{2m_{nucleus}\times K}$

$\Rightarrow K = 1.1\times 10^3$ eV = 1.1 KeV.

8. In a sample.....

Sol. $N_A = 2N_B$ (given)

$N_0e^{-\lambda_1 t} = 2N_0e^{-\lambda_2 t}$

$e^{-(\lambda_1-\lambda_2)t} = 2$

$-(\lambda_2-\lambda_1)t = \ell n\, 2$

$(\lambda_2-\lambda_1)t = \ell n\, 2$

$\left(\frac{1}{T_B}-\frac{1}{T_A}\right)t = 1$

$\left(\frac{1}{1.5}-\frac{1}{T_A}\right)\times 3 = 1$

$\frac{2}{3}-\frac{1}{T_A} = \frac{1}{3}$

$T_A = 3$

9. The potential.....

Sol. $\frac{KQ}{NR}+\frac{K_1Q}{NR}+\frac{K(3Q)}{NR}+.....+\frac{K(3Q)}{NR}$

$= \frac{KQ}{NR}\left(\frac{N(N+1)}{2}\right) = \frac{Q(N+1)}{8\pi\in_0 A}$

10. A small block.....

Sol. There will be no effect of magnetic force on time period because the magnetic force will be perpendicular to the inclined plane.

11. Consider the.....

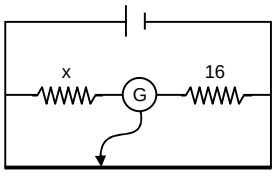
Sol. $\tau_1 = RC$; $\tau_2 = \frac{L}{R} \Rightarrow LC = t_1t_2 = 0.1$ sec $\Rightarrow T = 2\pi\sqrt{LC} = 2\pi\sqrt{\frac{1}{10}} = 2$ sec.

14. Four small.....

Sol. On equitorial position field due to magnet pair cancel each other.

18. In a meter.....

Sol.



$\frac{x}{16} = \frac{36}{64} = 9\Omega$

$$\frac{dx}{x} = \frac{d\ell}{\ell(1-\ell)} = \frac{10^{-1}\times 100}{36\times 64}$$

$$dx = \frac{9\times 10}{36\times 64} = \frac{5}{128}\Omega$$

$$x = 9 \pm \frac{5}{128}$$

19. In a Young's .....

Sol. $t(\mu - 1) = n\lambda = 30\lambda$

$$t = \frac{30\times 480\times 10^{-9}}{0.6} = 0.024 \text{ mm}$$

21. A beam.....

Sol. Let n be the average no. of electrons per unit volume, present in the beam of electrons, then impulse-momentum theorem gives

$(nAv)(mv) = F, \quad P = F/A$

$\Rightarrow \quad n = P/(mv^2)$

$\therefore \quad i = nAve = \dfrac{APe}{mv}$

24. In the.....

Sol. $I = \dfrac{8-0.5}{2.2\times 10^3} = \dfrac{7.5}{2.2}$ mA = 3.4 mA

25. A T.V. tower.....

Sol. $d = \sqrt{2Rh}$

$N = \pi d^2\sigma = 2\pi Rh\,\sigma$

$= 2 \times 3.14 \times 6400 \times 0.1 \times 1000$

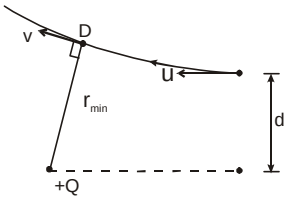
$= 2 \times 3.14 \times 6.4 \times 10^5$

$= 40.2 \times 10^5$

26. A positive.....

Sol. The path of the particle will be as shown in the figure. At the point of minimum distance (D) the velocity of the particle will be $\perp$ to its position vector w.r. to +Q.

Now by conservation of energy :-



$$\frac{1}{2}mu^2 + 0 = \frac{1}{2}mv^2 + \frac{KQq}{r_{min}} \qquad \text{.....(1)}$$

Torque on q about Q is zero hence angular momentum about Q will be conserved

$\Rightarrow \quad m\,v\,r_{min} = m\,ud$ .....(2)

by (2) in (1) $\Rightarrow \quad \dfrac{1}{2}mu^2 = \dfrac{1}{2}m\left(\dfrac{ud}{r_{min}}\right)^2 + \dfrac{KQq}{r_{min}}$

$$\Rightarrow \quad \frac{1}{2}mu^2\left(1-\frac{d^2}{r_{min^2}}\right) = \frac{mu^2d}{r_{min}}$$

$\{\because \quad KQq = mu^2d$ (given $\}$

$\Rightarrow \quad r^2_{min} - 2r_{min}\,d - d^2 = 0$

$$\Rightarrow \quad r_{min} = \frac{2d \pm \sqrt{4d^2+4d^2}}{2} = d(1 \pm \sqrt{2})$$

distance cannot be negative

y $\mathbf{r_{min} = d(1+\sqrt{2})}$ **Ans.**

27. A particle .....

Sol. Initial seperation is large so

$$\frac{1}{2}mu^2 + 0 = \frac{1}{2}m.(2u)^2 - \left(\frac{1}{4\pi\in_0}\right)\frac{q^2}{r}$$

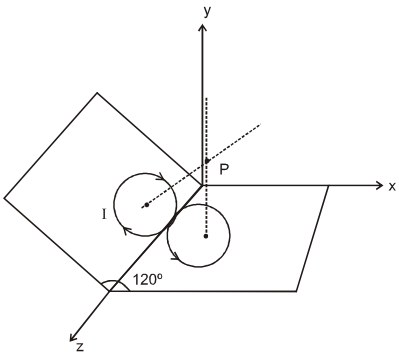
$$r = \frac{2q^2}{4\pi\in_0 .3mu^2}$$

$$= \frac{9\times 10^9\times 2\times(2\times 10^{-6})^2}{3\times 1\times(200)^2}$$

$$r = \frac{6}{10^7}.$$

28. A thin .....

Sol.



$$B_1 = \frac{\mu_0 I}{2}\,\frac{R^2}{(R^2+3R^2)^{3/2}} = \frac{\mu_0 I}{16R}$$

$B^2 = B_1{}^2 + B_1{}^2 + 2B_1\,B_1 \cos 120$

$$\Rightarrow B = B_1 = \frac{\mu_0 I}{16R} = \frac{3\mu_0 I}{48R}$$

29. In the shown.....

Sol. $\tau_{y\text{-axis}} = I_{y\text{-axis}}\,\alpha$

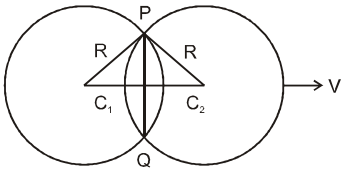
$(I.\pi r^2)\,B = 1/2\ mr^2\alpha$

$\alpha = 12$ rad/sec^2

$\therefore$ X = 3

30. A uniform.....

Sol. $\varepsilon = |(\vec{v}\times\vec{B}).\vec{\ell}|$



ε = VB (PQ)

$= VB\ 2\sqrt{R^2-\left(\frac{vt}{2}\right)^2} = VB\ \sqrt{4R^2-V^2t^2}$

$= 4 \times 0.25\ \sqrt{4\times25-16\times4}$

= 6 volt

PART-B : CHEMISTRY

31. In aqueous solution ……..

Sol. H_3O^+ , $H_2PO_4^-$, HPO_4^{2-} , PO_4^{3-} , H_2O, H_3PO_4,OH^-

32. Which of the following will ……..

Sol. $Fe(OH)_3$ is a positive sol. Hence greater the charge on cation more is coagulation power.

33. The electrons identified ……..

Sol. (a) 5 p (b) 5 s (c) 4 d (d) 4 ps

Acc. to (n + ℓ) rule, increasing order of energy

(d) < (b) < (c) < (a)

34. **Statement-1 :** For an element ……..

Sol. Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

35. An ionic solid XY crystallises ……..

Sol. $\frac{r^+}{r^-}$ = 0.225

37. In which of the following ……..

Sol. If Δ > P complex would be low spin & pairing will occur.

38. $PtCl_4.6H_2O$ can exist as ……..

Sol. $|\Delta T_f|_0 = i\,K_f\,m$

or $3.72 = i \times 1.86 \times 1$

or i = 2

39. Identify the reaction which ……..

Sol. $B_2H_6 + 2LiH \longrightarrow 2LiBH_4$

40. Which of the following compound ……..

Sol. (1) Dimer of ICl_3, hybridization of I is sp^3d^2 shape square planar.

(2) sp^3d^2 , shape square planar.

(3) dsp^2, shape square planar.

41. Carbon suboxide (C_3O_2) can ……..

Sol. $3\,CH_2(COOH)_2 + P_4O_{10} \longrightarrow 3C_3O_2 + 4H_3PO_4$

42. What is the value of $pK_b(CH_3COO^-)$……..

Sol. $\alpha = \frac{7.8}{390} = 2\times10^{-2}$

$K_a = c\alpha^2 = 16\times10^{-6}$

or $pK_a = 4.8$

43. The enthalpy of combustion of ……..

Sol. $C_6H_8 + 2H_2 \longrightarrow C_6H_{12}$, ΔH_r = ?

$\Delta H_r = \sum \nu \Delta H_C(R) - \sum \nu \Delta H_C(P)$

ν = stoichiometric coefficient

= –3680 + 2×(–241) – (–3920)

= –242 KJ/mol

44. The slag produced during formation ……..

Sol. $CaO + SiO_2 \longrightarrow CaSiO_3$ (In blast furnace)

$MnO + SiO_2 \longrightarrow MnSiO_3$ (in purification of pig iron)

45. Which of the following statement ……..

Sol. M–C π bond in metal carbonyls is formed by the donation of pair of e^- from a filled d-orbital of metal to vacant antibonding orbital (π^*) in CO.

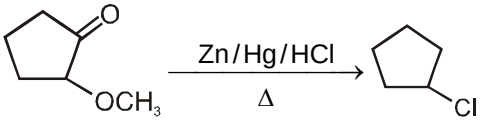
46. Select the true/false statements ……..

Sol. **S_1 :** Rate of hydrogenation $\propto \frac{1}{\text{steric crowding}}$

S_2 : Rate of nucleophile attack on carbonyl is

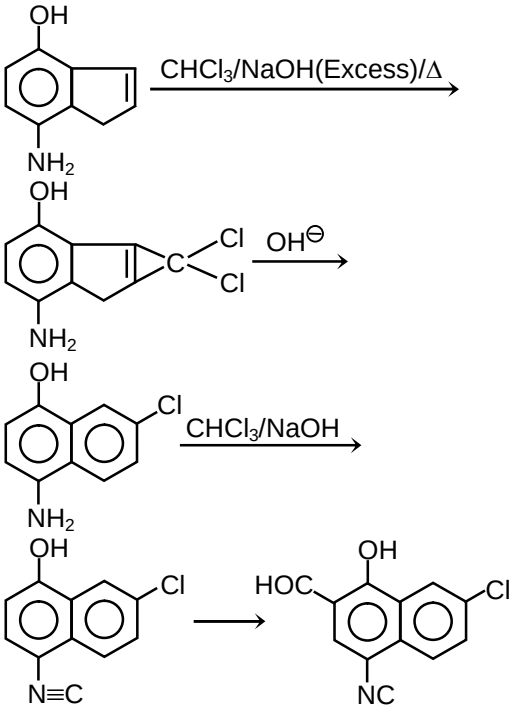
$\propto \frac{1}{\text{steric crowding}}$

S_3 : In aqueous medium grignard gives hydrocarbon by acid base reaction

S_4 : 

47. The end product of the ……..

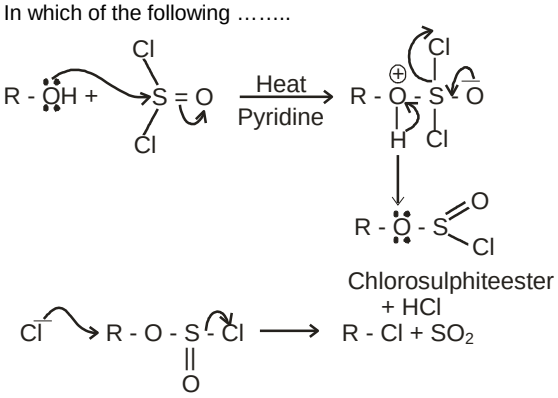
Sol.



It is under going Riemer-tiemann reaction and also carbene addition w.r.t to double bond

48. In which of the following ……..

Sol.



Second step is an S_N^2 Mechanism therefore inversion occur.

49. $Ph-C(=O)-C(Et)(Me)-C(=O)-CH_3$ ……..

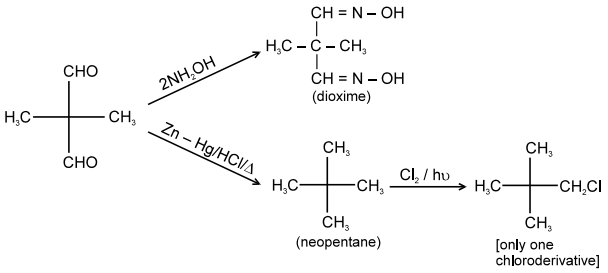
Sol. $Ph-C(=O)-C(Et)(Me)-C(=O)-CH_3$

$\xrightarrow[(2)\ H^{\oplus}]{(1)\ I_2/OH^{\ominus}} Ph-C(=O)-C(Et)(Me)-C(=O)-OH$

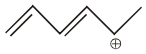
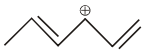
$\xrightarrow[-CO_2]{\Delta} Ph-C(=O)-CH(Et)-Me$

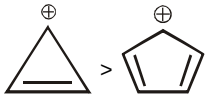
50. Compound X ($C_5H_8O_2$) forms ……..

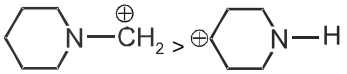
Sol.(3)



51. The incorrect stability ……..

Sol. (1)  >  (due to extended conjugation)

(2)  (due to aromaticity)

(3)  (due to +m effect)

(4) $CH\equiv C-\overset{\oplus}{C}H_2 < CH_2=CH-\overset{\oplus}{C}H_2$

(due to equalivant resonating structure)

52. 0.2% solution of phenol ……..

Sol. On the basis of theory refer Chemistry in Everyday life

54. Consider the following reactions……..

Sol. **(4)** D-Fructose is a toutomer of D-Glucose and D-Mannose.

55. Identify the product C in the ……..

Sol. $CH_3 - CN + 4H \xrightarrow{Na/C_2H_5OH} \underset{(A)}{CH_3CH_2NH_2}$

$CH_3CH_2NH_2 + HO - N = O \longrightarrow CH_3 - CH_2OH + N_2 + H_2O$

$CH_3CH_2OH \xrightarrow[KMnO_4]{[O]} \underset{(C)}{CH_3COOH}$

y **(1)**

56. A sample of 3 gram (92% pure) ……..

Sol. $Ag_2CO_3(s) \xrightarrow{\Delta} 2Ag(s) + CO_2(g) + \frac{1}{2}O_2(g)$

Weight of pure $Ag_2CO_3 = 3\times\frac{92}{100} = 2.76$ gram

Mole of $Ag_2CO_3 = \frac{2.76}{276} = 0.01$ mol

Mole of evolved CO_2 = mole of Ag_2CO_3

Mole of evolved $O_2 = \frac{1}{2}$ mole of Ag_2CO_3

Total mole of gaseous products = $0.01+\frac{1}{2}\times0.01$

= 0.01+0.005

= 0.015 mol

Volume at STP = 0.015×22400= 336 mL

57. Given $E^{o}_{Cu^{+}/Cu}$ = ……..

Sol. $Cu^{+} + e^{-} \longrightarrow Cu$

$Cu^{+} \longrightarrow Cu^{2+} + e^{-}$

E^{o}_{Cell} = 0.52 – 0.16 = 0.36V

At equilibrium E_{cell} = 0

$E = E^{o} - \frac{0.06}{n}\log K_C$

$0 = 0.36 - \frac{0.06}{1}\log K_C$

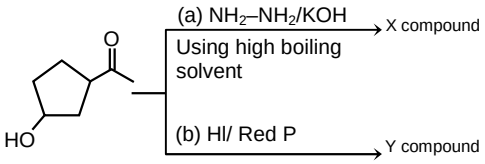
$\log K_C = \frac{0.36}{0.06} = 6$

$K_C = 10^6$

58. In the decomposition of ……..

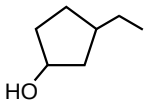
Sol. $t_{1/2} \propto (a)^{1-n}$

59.

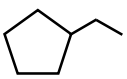


…….

Sol.



compound X



Compound Y

Therefore molecular weight difference equal to 16 gram/mol.

60. Number of optically active ……..

Sol. Number of optically active isomer = $2^{n-1} - 2^{\frac{n-1}{2}}$

= $2^{3-1} - 2^{\frac{3-1}{2}}$ = 2

PART-C : MATHEMATICS

61. A relation R is.....

Sol. a – a = 0 $\Rightarrow$ non negative integer so reflexive

a – b = non negative integer

$\Rightarrow$ (b – a) $\neq$ non negative integer $\Rightarrow$ not symmetric

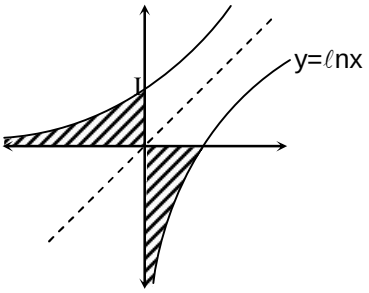
$\Rightarrow$ a – b = I_1(non negative integer), b – c = I_2 (non negative integer)

$\Rightarrow$ then $I_1 + I_2$ = a – b + b – c = non negative integer

$\Rightarrow$ (a, c) $\in$ relation $\Rightarrow$ transitive

62. Area bounded.....

Sol.



Area = $-\int_0^1 \ell n\, x \,.\, dx = \int_{-\infty}^{0} e^{x}\, dx = 1$ as ℓnx and e^x are inverse of each other.

63. Number of ways of.....

Sol. **Case –I :** when both person selected

$\Rightarrow {}^{2}C_2 \,.\, {}^{7}C_5 = 21$

Case-II : when both person not selected

${}^{7}C_7 = 1$

Ans = case I + case II = 21 + 1 = 22

64. If $x = \int_0^y \frac{1}{1+t^2}\, dt$.....

Sol. $x = \int_0^y \frac{1}{1+t^2}\, dt = \left(\tan^{-1} t\right)_0^y$

$x = \tan^{-1} y \Rightarrow y = \tan x \Rightarrow \frac{d^2y}{dx^2} = 2\sec^2 x \tan x$

$\Rightarrow \frac{d^2y}{dx^2} = 2\tan x + 2\tan^3 x$

65. $\int \frac{dx}{x^2\sqrt{a^2x^2+1}}$ equals .....

Sol. $\int \frac{dx}{x^2\sqrt{a^2x^2+1}} = \int \frac{dx}{x^3\sqrt{a^2+x^{-2}}} \Rightarrow$ let $a^2 + x^{-2} = t$

$-2.x^{-3}\, dx = dt \Rightarrow x^{-3}dx = -\frac{1}{2}\, dt$

$\Rightarrow -\frac{1}{2}\int \frac{dt}{\sqrt{t}} \Rightarrow -\frac{1}{2}\cdot\frac{t^{1/2}}{1/2} + c \Rightarrow -\sqrt{a^2+x^{-2}} + c$

66. The value of .....

Sol. Let y > 0 such that y = –x

then $\lim\limits_{x\to -1} \dfrac{\cos 2-\cos 2x}{x^2-|x|}$

$= \lim\limits_{y\to 1} \dfrac{\cos 2-\cos 2y}{y^2-y} = \lim\limits_{y\to 1} \dfrac{2\sin 2y}{2y-1}$

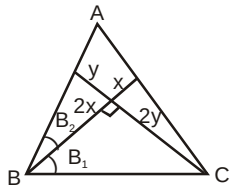
$= \dfrac{2\sin 2}{2-1} = 2 \sin 2$

67. Value of $(\hat{a}\times\hat{b}\,.\,\hat{i})\,\hat{i}$ + ...

Sol. $[\hat{a}\ \hat{b}\ .\ \hat{i}\,]\hat{i} + [\hat{a}\ \hat{b}\ .\ \hat{j}\,]\hat{j} + [\hat{a}\ \hat{b}\ .\ \hat{k}\,]\hat{k} = \hat{a}\times\hat{b}$

68. In a ΔABC If medians.....

Sol.



$\tan B_1 = \dfrac{2y}{2x}$, $\tan B_2 = \dfrac{y}{2x}$

$B = B_1 + B_2$

$\tan B = \dfrac{\frac{y}{x}+\frac{y}{2x}}{1-\frac{y}{x}\frac{y}{2x}} = \dfrac{3yx}{2x^2-y^2}$

$\cot B = \dfrac{2x^2-y^2}{3xy}$

Similarly $\cot C = \dfrac{2y^2-x^2}{3xy}$

$\cot B + \cot C = \dfrac{x^2+y^2}{3xy} \geq \dfrac{2}{3}$

69. Equation of plane.....

Sol. Equation of plane is $\begin{vmatrix} x-1 & y-1 & z-1 \\ 1 & 2 & 3 \\ 1 & 3 & 5 \end{vmatrix} = 0$

$\Rightarrow (x-1) - 2(y-1) + (z-1) = 0$

$\Rightarrow x - 2y + z = 0$

70. If z and ω are two.....

Sol. $\dfrac{2z}{\omega} = e^{i\theta}$

$\dfrac{\omega}{2z} = e^{-i\theta}$

$\Rightarrow \dfrac{2z}{\omega} + \dfrac{\omega}{2z} = 2\cos\theta$

$\therefore$ locus is real axis.

71. Let f(x) = tanx, ...

Sol. $g(f(x)) = \tan\left(x-\dfrac{\pi}{4}\right) = \dfrac{\tan x-1}{\tan x+1}$

$\Rightarrow g(x) = \dfrac{x-1}{x+1} \Rightarrow f(g(x)) = \tan\left(\dfrac{x-1}{x+1}\right)$.

72. Let $f(x) = \dfrac{a^2-4}{a^2+2}$ .....

Sol. $f'(x) = \dfrac{a^2-4}{a^2+2}\ 3x^2 - 3$

f(x) is a decreasing function on R, only when

$\dfrac{a^2-4}{a^2+2} \leq 0$

$\therefore a^2 - 4 \leq 0 \Rightarrow -2 \leq a \leq 2$

73. If a , b, c are the.....

Sol. $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = (a+b+c)(ab+bc+ac-a^2-b^2-c^2)$

$= -\dfrac{1}{2}(a+b+c)((a-b)^2+(b-c)^2+(c-a)^2)$

= always negative

74. If $[\cot^{-1}x] + [\cos^{-1}x] = 0$, ...

Sol. $[\cot^{-1}x] + [\cos^{-1}x] = 0$

$\Rightarrow [\cot^{-1}x] + [\cos^{-1}x] = 0$

as $\cos^{-1}x \geq 0$ and $\cot^{-1}x > 0$

Now, $[\cot^{-1}x] = 0$

$\Rightarrow x \in (\cot 1, \infty)$, and $[\cos^{-1}x] = 0$

$\Rightarrow x \in (\cos 1, 1]$

$\Rightarrow x \in (\cot 1, 1]$

75. If f(x) be continuous.....

Sol. Here $f(x) = \dfrac{x^3-2x^2-x+2}{x^2-4}$, $x \neq \pm 2$

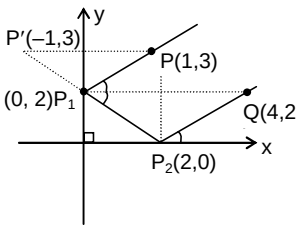
$\because$ f(x) is continuous at x = 2

$\Rightarrow f(2) = \lim\limits_{x\to 2} f(x)$

$= \lim\limits_{x\to 2} \dfrac{(x^2-1)(x-2)}{(x+2)(x-2)} = \dfrac{3}{4}$

76. A line is coming.....

Sol.



equation of P_1P_2 is $y = 2 - x$

$\Rightarrow$ P_2 is (2, 0)

Q is (4, 2)

$\Rightarrow$ equation of P_2Q is $y = x - 2$

77. In a bag there are.....

Sol. $\frac{4}{9}.\frac{3}{8}.\frac{2}{7}+\frac{3}{9}.\frac{2}{8}.\frac{2}{7}+2.\frac{4}{9}.\frac{3}{8}.\frac{2}{7} = \frac{1}{6}$

78. Numerically greatest.....

Sol. Put x = 1 for coefficient

$r \le \frac{n+1}{1+\left|\frac{a}{b}\right|} \Rightarrow r \le \frac{11}{3/2}$

$\Rightarrow r \le \frac{22}{3} \Rightarrow r \le 7.3$

so final r = 7

so numerically greatest term = $^{10}C_7.(1)^{10-7}(2)^7$

= $(^{10}C_7 \,.\, 2^7)$

79. The tangent at.....

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

$A = \left(x_1 - \frac{y_1}{m}, 0\right)$

$a^2 = \left|\frac{(y_1)\left(x_1 - \frac{y_1}{m}\right)}{2}\right|$

$\frac{dx}{dy} - \frac{x}{y} = \pm 2\frac{a^2}{y^2}$

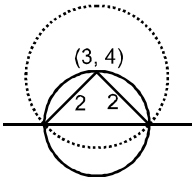
Linear in x. If $e^{\int \frac{-dy}{y}} = \frac{1}{y}$

$\frac{x}{y} = \int \pm\frac{2a^2}{y^2}dy$

$x = cy + \frac{a^2}{y}$

80. The equation of.....

Sol. Equation of circle is $(x - 3)^2 + (y - 4)^2 = 4$



$\therefore$ equation of common chord is $3x + 4y = 23$

81. The coefficient .....

Sol. $\sigma^2 = \left(\frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2\right) = \left(\frac{\sum n^2}{n} - \left(\frac{\sum x}{n}\right)^2\right)$

$= \frac{n^2 - 1}{12}$

so standard deviation = $\sqrt{\frac{n^2 - 1}{12}}$

mean $(\bar{x}) = \frac{\sum x_i}{n} = \frac{n(n+1)}{2n} = \frac{(n+1)}{2}$

so coefficient of variation = $\frac{\sigma}{\bar{x}} \times 100 = \sqrt{\frac{(n-1)}{3(n+1)}} \times 100$

82. The system of.....

Sol. Augmented matrix = $\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & \lambda \\ 1 & 4 & 10 & \lambda^2 \end{bmatrix}$

$R_2 \to R_2 - R_1$ and $R_3 \to R_3 - R_1$

$= \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 3 & \lambda - 1 \\ 0 & 3 & 9 & \lambda^2 - 1 \end{bmatrix}$

$R_3 \to R_3 - 3R_2$

$= \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 3 & \lambda - 1 \\ 0 & 0 & 0 & \lambda^2 - 3\lambda + 2 \end{bmatrix}$

$\therefore$ The system of equation will have solution if

$\lambda^2 - 3\lambda + 2 = 0$

$\Rightarrow \lambda = 1, 2$

83. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be.....

Sol. $-\vec{c}\times(\vec{a}\times\vec{b}) = \frac{1}{3}|\vec{b}||\vec{c}|\vec{a}$

$-[(\vec{c}.\vec{b})\vec{a} - (\vec{c}.\vec{a})\vec{b}] = \frac{1}{3}|\vec{b}||\vec{c}|\vec{a}$

$(\vec{c}.\vec{a})\vec{b} - (\vec{c}.\vec{b})\vec{a} = \frac{1}{3}|\vec{b}||\vec{c}|\vec{a}$

$(\vec{c}.\vec{a})\vec{b} = |\vec{c}||\vec{b}|\ [\cos\theta + \frac{1}{3}]\ \vec{a}$

but $\vec{a}$ and $\vec{b}$ are not collinear

so, $\vec{a}\ .\ \vec{c} = 0$ and $\cos\theta = -\frac{1}{3}$

$\sin\theta = \frac{2\sqrt{2}}{3}$

84. Sum of the sequence.....

Sol. $T_n = \frac{((n+3)-(n+1))}{(n+1)(n+2)(n+3)}\times\frac{1}{2}$

$Tn = \frac{1}{2}\left[\frac{1}{(n+1)(n+2)} - \frac{1}{(n+2)(n+3)}\right]$

$S_\infty = \frac{1}{2}\left[\left(\frac{1}{2.3}-\frac{1}{3.4}\right)+\left(\frac{1}{3.4}-\frac{1}{4.5}\right)+\left(\frac{1}{4.5}-\frac{1}{5.6}\right)+.....\right]$

$S_\infty = \frac{1}{12}$

85. Let $f(x) = ax^2 + bx + c\ (a \neq 0)$ .....

Sol: $f(x) = ax^2 + bx + c\ (a \neq 0)$

Let α and $\frac{1}{\alpha}$ be its positive distinct roots

$\Rightarrow$ One root is smaller than 1 and other is greater than 1

$\Rightarrow af(1) < 0$

86. The minimum.....

Sol. L_1 is parallel $b_1 = \hat{i} + \hat{j} + \hat{k}$

L_2 is parallel to $b_2 = 2\hat{i} + 2\hat{j} + 3\hat{k}$

a_1 = point on line $L_1 = \hat{i} + 2\hat{j} + 2\hat{k}$

a_2 = point on line $L_2 = -2\hat{i} - \hat{j} - 2\hat{k}$

minimum distance $= \frac{|(\vec{a}_1 - \vec{a}_2).\vec{b}_1\times\vec{b}_2|}{|\vec{b}_1\times\vec{b}_2|} = 0$

87. If n is any integer.....

Sol. Since $\cos(2n+1)(\pi - x) = \cos[(2n+1)\pi - (2n+1)x]$

$= -\cos(2n+1)x$ and $\cos^2(\pi - x) = \cos^2 x$

So that $f(2a - x) = -f(x)$ and hence by the property of definite integral

$\int_0^\pi e^{\cos^2 x}\cos^3(2n+1)x\,dx = 0$

88. If radius of the.....

Sol. $\frac{(3x+4y-2)^2}{100} + \frac{(4x-3y+5)^2}{625} = 1$

$\Rightarrow \frac{\left(\frac{3x+4y-2}{5}\right)^2}{4} + \frac{\left(\frac{4x-3y+5}{5}\right)^2}{25} = 1$

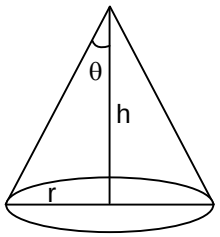
$\Rightarrow a^2 = 4\ \&\ b^2 = 25$

radius of director circle $= \sqrt{a^2+b^2}$

$r = \sqrt{29} \Rightarrow [r] = 5$

89. Volume of cone.....

Sol.



$\tan\theta = \frac{r}{h} \Rightarrow r = \frac{h}{3}$

$\Rightarrow V = \frac{1}{3}\pi r^2 h = \frac{1}{27}\pi h^3$

$\Rightarrow \frac{dV}{dt} = \frac{1}{9}\pi.h^2\frac{dh}{dt}$

$\Rightarrow 9\pi = \frac{1}{9}.\pi.9.\frac{dh}{dt} \Rightarrow \frac{dh}{dt} = 9$

90. Number of points.....

$f(x) = ||x| - 1| + |\cos\pi x|$.....

Sol. In $x \in (-2, -2)$

$||x| - 1|$ is not differentiable

at $x = -1, 0, 1$

$|\cos\pi x|$ is not differentiable

at $x = -\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}, \frac{3}{2}$

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MAJOR TEST-1 (MT-1)
(JEE MAIN PATTERN)
TARGET : JEE (MAIN+ADVANCED) 2018
COURSE : VIJETA (02JP)

DATE : 26-12-2017

ANSWER KEY

CODE-0

PHYSICS

1.	(4)	**2.**	(4)	**3.**	(2)	**4.**	(2)	**5.**	(2)	**6.**	(1)	**7.**	(4)
8.	(2)	**9.**	(1)	**10.**	(1)	**11.**	(1)	**12.**	(2)	**13.**	(1)	**14.**	(1)
15.	(2)	**16.**	(2)	**17.**	(3)	**18.**	(1)	**19.**	(4)	**20.**	(1)	**21.**	(1)
22.	(2)	**23.**	(1)	**24.**	(1)	**25.**	(2)	**26.**	(1)	**27.**	(6)	**28.**	(3)
29.	(3)	**30.**	(6)										

CHEMISTRY

31.	(3)	**32.**	(1)	**33.**	(2)	**34.**	(1)	**35.**	(3)	**36.**	(3)	**37.**	(4)
38.	(3)	**39.**	(3)	**40.**	(4)	**41.**	(2)	**42.**	(2)	**43.**	(2)	**44.**	(1)
45.	(3)	**46.**	(3)	**47.**	(4)	**48.**	(3)	**49.**	(2)	**50.**	(3)	**51.**	(3)
52.	(1)	**53.**	(4)	**54.**	(4)	**55.**	(1)	**56.**	(3)	**57.**	(6)	**58.**	(2)
59.	(4)	**60.**	(2)										

MATHEMATICS

61.	(2)	**62.**	(3)	**63.**	(2)	**64.**	(2)	**65.**	(3)	**66.**	(1)	**67.**	(2)
68.	(2)	**69.**	(3)	**70.**	(1)	**71.**	(1)	**72.**	(3)	**73.**	(2)	**74.**	(3)
75.	(2)	**76.**	(2)	**77.**	(3)	**78.**	(4)	**79.**	(1)	**80.**	(1)	**81.**	(2)
82.	(3)	**83.**	(4)	**84.**	(1)	**85.**	(2)	**86.**	(0)	**87.**	(0)	**88.**	(5)
89.	(9)	**90.**	(7)										

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ANSWER KEY

CODE-1

PHYSICS

1.	(2)	**2.**	(2)	**3.**	(4)	**4.**	(1)	**5.**	(3)	**6.**	(3)	**7.**	(2)
8.	(1)	**9.**	(3)	**10.**	(4)	**11.**	(2)	**12.**	(4)	**13.**	(2)	**14.**	(3)
15.	(1)	**16.**	(3)	**17.**	(1)	**18.**	(2)	**19.**	(1)	**20.**	(2)	**21.**	(4)
22.	(1)	**23.**	(2)	**24.**	(3)	**25.**	(1)	**26.**	(1)	**27.**	(6)	**28.**	(3)
29.	(3)	**30.**	(6)										

CHEMISTRY

31.	(3)	**32.**	(2)	**33.**	(3)	**34.**	(1)	**35.**	(2)	**36.**	(3)	**37.**	(3)
38.	(4)	**39.**	(3)	**40.**	(4)	**41.**	(3)	**42.**	(2)	**43.**	(3)	**44.**	(1)
45.	(3)	**46.**	(4)	**47.**	(4)	**48.**	(2)	**49.**	(2)	**50.**	(4)	**51.**	(4)
52.	(1)	**53.**	(4)	**54.**	(3)	**55.**	(1)	**56.**	(3)	**57.**	(6)	**58.**	(2)
59.	(4)	**60.**	(2)										

MATHEMATICS

61.	(2)	**62.**	(2)	**63.**	(3)	**64.**	(3)	**65.**	(2)	**66.**	(2)	**67.**	(3)
68.	(3)	**69.**	(4)	**70.**	(2)	**71.**	(2)	**72.**	(2)	**73.**	(3)	**74.**	(4)
75.	(3)	**76.**	(3)	**77.**	(2)	**78.**	(3)	**79.**	(2)	**80.**	(2)	**81.**	(3)
82.	(2)	**83.**	(3)	**84.**	(2)	**85.**	(1)	**86.**	(0)	**87.**	(0)	**88.**	(5)
89.	(9)	**90.**	(7)										

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ANSWER KEY

CODE-2

PHYSICS

1.	(4)	**2.**	(4)	**3.**	(2)	**4.**	(2)	**5.**	(2)	**6.**	(1)	**7.**	(4)
8.	(2)	**9.**	(1)	**10.**	(1)	**11.**	(1)	**12.**	(2)	**13.**	(1)	**14.**	(1)
15.	(2)	**16.**	(2)	**17.**	(3)	**18.**	(1)	**19.**	(4)	**20.**	(1)	**21.**	(1)
22.	(2)	**23.**	(1)	**24.**	(1)	**25.**	(2)	**26.**	(1)	**27.**	(6)	**28.**	(3)
29.	(3)	**30.**	(6)										

CHEMISTRY

31.	(3)	**32.**	(1)	**33.**	(2)	**34.**	(1)	**35.**	(3)	**36.**	(3)	**37.**	(4)
38.	(3)	**39.**	(3)	**40.**	(4)	**41.**	(2)	**42.**	(2)	**43.**	(2)	**44.**	(1)
45.	(3)	**46.**	(3)	**47.**	(4)	**48.**	(3)	**49.**	(2)	**50.**	(3)	**51.**	(3)
52.	(1)	**53.**	(4)	**54.**	(4)	**55.**	(1)	**56.**	(3)	**57.**	(6)	**58.**	(2)
59.	(4)	**60.**	(2)										

MATHEMATICS

61.	(2)	**62.**	(3)	**63.**	(2)	**64.**	(2)	**65.**	(3)	**66.**	(1)	**67.**	(2)
68.	(2)	**69.**	(3)	**70.**	(1)	**71.**	(1)	**72.**	(3)	**73.**	(2)	**74.**	(3)
75.	(2)	**76.**	(2)	**77.**	(3)	**78.**	(4)	**79.**	(1)	**80.**	(1)	**81.**	(2)
82.	(3)	**83.**	(4)	**84.**	(1)	**85.**	(2)	**86.**	(0)	**87.**	(0)	**88.**	(5)
89.	(9)	**90.**	(7)										