MAJOR TEST (MT)

(JEE MAIN PATTERN)

TARGET : JEE (MAIN+ADVANCED) 2019

DATE : 03-03-2019 **COURSE : VIJAY(JR) & AJAY(ER)**

HINTS & SOLUTIONS

PART-A : PHYSICS

1. Two balls A ……………………..

Sol. Vertical components of velocities of A and B are same. So they collide.

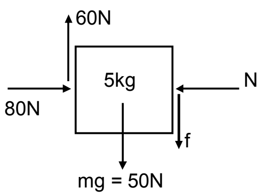
Time to collide, t = $\frac{6}{10\sin 37^o}$ = 1 sec

Height of balls at time of collision,

H = 8 x 1 – $\frac{1}{2}$ x 10 x 1^2 = 3m

2. A 5 kg block ……………………..

Sol.



Normal reaction

N = 80 Newton

Limiting friction = μN

= 20 Newton

f + 50 = 60 $\Rightarrow$ f = 10 (downward)

3. A block is ……………………..

Sol. mg – N = $\frac{mv^2}{R}$

= $\frac{m}{R}\cdot\frac{3gR}{4}$ $\Rightarrow$ N = $\frac{mg}{4}$

$\Rightarrow$ friction, f = μN = $\frac{mg}{8}$

$\Rightarrow$ tangential acceleration = $\frac{g}{8}$

4. Ball-1 collides ……………………..

Sol. $v_2 = 2v_1$

$\frac{m_1(1+e)}{m_1+m_2}$.u = 2. $\left(\frac{m_1 - em_2}{m_1+m_2}\right)$u ; $m_1 = m_2$

$\Rightarrow$ 1+ e = 2(1 – e) $\Rightarrow$ e = $\frac{1}{3}$

5. If a spherical ……………………..

Sol. Fraction = $\dfrac{\frac{1}{2}\cdot\frac{2}{5}MR^2\omega^2}{\frac{1}{2}M\omega^2R^2 + \frac{1}{2}\cdot\frac{2}{5}MR^2\omega^2}$ = $\frac{2}{7}$

6. Water is filled ……………………..

Sol. R = $\sqrt{2g(4-h)}\cdot\sqrt{\frac{2h}{g}}$

= 2$\sqrt{(4-h)h}$

$\frac{dR}{dh}$ = 0 $\Rightarrow$ h = 2m

7. Imagine a light ……………………..

Sol. $\frac{K}{R^3}$ = $m\omega^2R$

$\Rightarrow$ w $\propto$ $\frac{1}{R^2}$ $\Rightarrow$ T $\propto$ R^2

8. The P-T diagram ……………………..

Sol. W = $\dfrac{R(T_0 - 2T_0)}{\frac{5}{3}-1}$ + R ($5T_0 - 2T_0$) + $\dfrac{R(5T_0 - 3T_0)}{\frac{5}{3}-1}$

+ R ($T_0 - 3T_0$)= + $\frac{3}{2}\,\frac{RT_0}{2}$

9. A person has ……………………..

Sol. angular magnification (max.) = 1 + $\frac{D}{f}$

= 1 + $\frac{20}{10}$ = 3

10. In a uniform ……………………..

Sol. E = $\left|\frac{\Delta V}{\Delta r}\right|$; if $\vec{E}$ and $\overrightarrow{\Delta r}$ are along same line then, E = 20 volt/meter.

If $\vec{E}$ and $\overrightarrow{\Delta r}$ are not along same line, then

$E = \left|\frac{\Delta V}{\Delta r'}\right|$; $\overrightarrow{\Delta r'}$ is component of $\overrightarrow{\Delta r}$ along $\vec{E}$.

11. It is given ……………………..

Sol. $\frac{\Delta P}{P} = 2 \times \frac{\Delta x}{x} + \frac{\Delta y}{y} + \frac{1}{2} \times \frac{\Delta z}{z}$

12. Two SHM are ……………………..

Sol. $y_1 = 6\cos(6\pi t + \pi/6)$

$\therefore A_1 = 6$

$y_2 = 3(\sqrt{3}\sin 3\pi t + \cos 3\pi t)$

$\therefore A_2 = 3\sqrt{3+1=6}$ so $\frac{A_1}{A_2} = 1$

13. Time period ……………………..

Sol. $T = 2\pi\sqrt{m\left[\frac{4}{K}+\frac{4}{K}+\frac{4}{K}\right]} = 4\pi\sqrt{\frac{3M}{K}}$ s

14. A string of ……………………..

Sol. from graph

Density (ρ) = x (x distance from one end)

$\rho = x$

Speed $= \sqrt{\frac{T}{\mu}} = \sqrt{\frac{T}{\rho A}}$

$v = \sqrt{\frac{T}{\rho A}} = \sqrt{\frac{T}{xA}}$

$\frac{dx}{dt} = \sqrt{\frac{T}{xA}}$

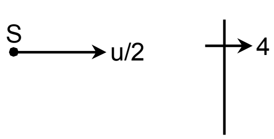
$\int_0^L \sqrt{\frac{xA}{T}}\, dx = \int_0^t dt$

$\frac{2}{3}\sqrt{\frac{LA}{T}}L = t$

$t = \frac{2}{3}\sqrt{\frac{A}{T}}L^{3/2}$

15. A wall is moving ……………………..

Sol.



$F^1_{wall\,(received)} = \frac{10u - u}{10u - u/2} f = \frac{9u}{9.5u} f \Rightarrow \lambda_1 = \frac{9.5u}{f}$

$F^{11}_{wall\,(received)} = \frac{10.u}{10u + u} f^1 = \frac{10u}{11u} \times \frac{9u}{9.5u} f \Rightarrow \lambda_2 = \frac{11u \times 9.5}{9f}$

$= \frac{\lambda_1}{\lambda_2} = \frac{9.5}{11 \times 9.5} \times 9 = \frac{9}{11}$

16. The circuit shown ……………………..

Sol. D_1 is forward biased and D_2 is reversed biased

17. Magnetic field ……………………..

Sol. $\frac{i_1}{i_2} = \frac{5\sqrt{5}}{2\sqrt{8}}$

$B_P = \frac{\mu_0 i_2 (2a)^2}{2((2a)^2 + (2a)^2)^{3/2}} - \frac{\mu_0 i_1 (a)^2}{2(a^2 + (2a)^2)^{3/2}} = 0$

$\Rightarrow \frac{i_2 \times 4}{8^{3/2}} = \frac{i_1}{(5)^{3/2}}$

$\frac{i_2 \times 4}{8\sqrt{8}} = \frac{i_1}{5\sqrt{5}}$ $\qquad \frac{i_1}{i_2} = \frac{5\sqrt{5}}{2\sqrt{8}}$

18. The magnetic ……………………..

Sol. $i.(t) = -\frac{1}{R}\frac{d\phi}{dt} = 2bt - 3at^2$

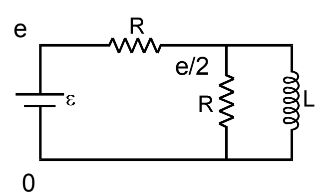
i is maximum when $\frac{di}{dt} = 0$

or $t = \frac{2b}{6a}$

Using values, at t = 1 s, i is maximum its value = 12 – 6 = 6A

19. The rate of ……………………..

Sol.



$\frac{e}{2} = L\frac{di}{dt}$

20. In Bohr's model ……………………..

Sol. $a = \frac{v^2}{r}$

$B = \frac{\mu_0}{4\pi}.\frac{ev}{r^2}$

$\frac{a}{B} \propto vr$ $\qquad$ But $v \propto \frac{z}{n}$

$$r \propto \frac{n^2}{z} \qquad \text{so. } \frac{a}{B} \propto n$$

21. A hydrogen ……………………..

Sol. $$\frac{1}{\lambda} = Rz^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$\frac{1}{\lambda} = Rz^2\left(\frac{1}{1^2} - \frac{1}{5^2}\right) = Rz^2\left(1 - \frac{1}{25}\right) = Rz^2 \times \frac{24}{25}$$

$$\frac{1}{\lambda} = Rz^2\left(\frac{1}{2^2} - \frac{1}{5^2}\right) = Rz^2\left(\frac{1}{4} - \frac{1}{25}\right) = Rz^2\left(\frac{21}{25 \times 4}\right)$$

$$\Rightarrow \frac{\lambda_1}{\lambda_2} = \left(\frac{1}{24}\right)\left(\frac{21}{4}\right) = \left(\frac{7}{32}\right)$$

22. Two species ……………………..

Sol. avg life = $\dfrac{\int tdN_1 + tdN_2}{2N_0}$

where $dN_1 = \lambda N_o e^{-\lambda t} dt$

$dN_2 = \dfrac{\lambda}{3} N_o e^{-\frac{\lambda}{3}t} dt$

avg. life = $\dfrac{\int_0^\infty t(\lambda N_o e^{-\lambda t} dt + \frac{\lambda}{3} N_o e^{-\frac{\lambda}{3}t} dt}{2N_0}$

Intergrating we got

avg life = $\dfrac{2}{\lambda} \approx \dfrac{2.10}{\lambda}$ **Ans. (B)**

23. A uniform ……………………..

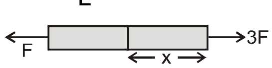
Sol. Tension in rod at a distance x from right edge is

a = $\dfrac{3F - F}{m}$ = $\dfrac{3F}{m}$

T_x = $F + \dfrac{M}{L}(L - x)\dfrac{2F}{m}$

= 3F – $\dfrac{2Fx}{L}$

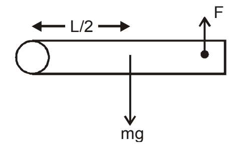
T_x = F(3 – 2$\dfrac{x}{L}$)



$\therefore$ net extension in rod = $\int_0^L \dfrac{T}{YA} dx$ = $\dfrac{2F}{YA}L$

24. A thin uniform ……………………..

Sol.



Taking torque about hinge :

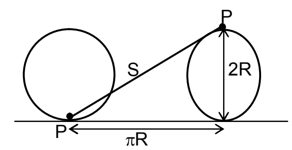
Mg L/2 = FL

$$mg\frac{L}{2} = 2\left(\frac{mV}{10}\right)10L$$

V = 2.5 m/sec

25. Given that P ……………………..

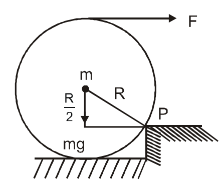
Sol.



$$\left|\vec{S}\right| = \sqrt{(\pi R)^2 + (2R)^2}$$

26. A uniform solid ……………………..

Sol.



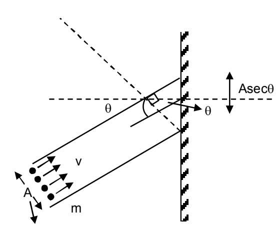
Let see torque about the corner point p, To loose contact

$$(F)\ \left(\frac{3R}{2}\right) \geq (mg)\ \left(\frac{\sqrt{3}R}{2}\right)$$

$$F \geq \frac{mg}{\sqrt{3}}.$$

27. A parallel beam ……………………..

Sol.



(cross sectional area)

Let us suppose that the cross section area of the beam is A. So the area on the wall where the particles collide is Asecθ.

Analysing the situation from any time 't' to ' + dt'. Number of particles colliding with thewall is :

N = (Vcosθ.dt)(Asecθ)n = nVA.dt

Change in themomentum for these momentum will only be in the direction along the normal of the wall.

So.

$$F = \frac{dP}{dt} = \frac{[m(2V\cos\theta)]\times[nVAdt]}{dt} = \frac{2mv^2nA.dt\cos\theta}{dt}$$

$$\Rightarrow \quad \frac{F}{A\sec\theta} = \frac{\cos\theta 2mV^2nA}{A\sec\theta} = 2mV^2n\cos^2\theta$$

So, pressure on the wall is : $P_{ball} = 2mnV^2\cos^2\theta$

28. A particle is ……………………..

Sol. Change in momentum = Impulse

$\Delta\vec{P} = J_x\hat{i} + J_y\hat{j} + J_z\hat{k}$ = 30(0.1) $\hat{i}$ + $\frac{1}{2}$ (80) (0.1) $\hat{j}$ +

(–50) × (0.1) $\hat{k}$ = $3\hat{i} + 4\hat{j} - 5\hat{k}$

$|\Delta\vec{P}| = 5\sqrt{2}$ kg $\frac{m}{sec.}$

29. Power supplied ……………………..

Sol. Appyling work energy theorem

$K_f = K_i$ + work done

$$\frac{1}{2}mv^2 = 0 + \int_0^2 Pdt = \int_0^2 \frac{3t^2}{2}dt$$

solving we get v = 2 m/s.

30. A beam of light ……………………..

Sol. $f_m = -R/2$

$f_\ell = 40$ m

$$\frac{1}{F} = \frac{1}{f_m} - \frac{2}{f_\ell}$$

$$-\frac{1}{7.5} = -\frac{2}{R} - \frac{2}{40}$$

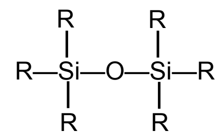
$$\frac{2}{R} = -\frac{2}{40} + \frac{10}{75} \qquad = -\frac{1}{20} + \frac{2}{15} = -\frac{15+40}{20\times 15}$$

$$\frac{2}{R} = \frac{255}{3\times 15}$$ R = 24 cm. **Ans. (B)**

PART-B : CHEMISTRY

31. Identify the incorrect ………….

Sol. The hydrolysis of Trialkylchlorosilane R_3SiCl, gives R_3SiOH which immediately gives dimer :



32. Bond distance in HF is ………….

Sol. Given = 1.60×10^{-19}C

d = 9.17×10^{-11} m

From $\mu = e \times d$

$\mu = 1.60\times10^{-19} \times 9.17\times10^{-11}$

% ionic character

$$= \frac{\text{Observed dipole moment}}{\text{Dipole moment for 100\% ionic bond}} \times 100$$

$$= \frac{6.104\times10^{-30}}{14.672\times10^{-30}}\times 100 = 41.6\%$$

33. Spin only magnetic moment ………….

Sol. $_{64}Gd = [Xe]\ 4f^7, 5d^1, 6s^2$

$_{64}Gd^{3+} = [Xe]\ 4f^7, 5d^0, 6s^0$

i.e. no. of unpaired electron = 7

$\sqrt{n(n+2)}$ = $\sqrt{7(7+2)}$ = $\sqrt{63}$ = 7.93 BM

34. The ppm level of F^- in a 500 g ………….

Sol. ppm = $\frac{\text{wt.of solute(g)}}{\text{wt. of solution(g)}} \times 10^6$

$= \frac{0.2}{500}\times 10^6$ = 400 ppm

35. Given ………….

Sol. Applying Hess' s Law :

$\Delta_fH^o = \Delta_{sub}H + \Delta_{diss}H + I.E. + \Delta_{ege}H + \Delta_{lattice}H$

–617 = 161 + 520 +77 + E.A. + (–1047)

$\Delta_{ege}H$ = –617+289= –328 kJ mol^{-1}

= –328 kJ mol^{-1}

36. Given ………….

Sol. Given

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$

ΔH^o = –285.9 kJ mol^{-1} ………….(1)

$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(g)$;

ΔH^o = –241.8 kJ mol^{-1} ………….(2)

$H_2O(l) \longrightarrow H_2O(g)$; ΔH^o = ?

On substracting equation (2) from equation (1) we get:

$H_2O(l) \longrightarrow H_2O(g)$; $\Delta H^o = -241.8-(-285.9)$

$= 44.1$ kJ mol^{-1}

37. The solubility order for alkali ....

Sol. Higher the lattice energy lower will be solubility.

38. Flocculation value of $BaCl_2$ ....

Sol. In first case the given compounds have same anion but different cations having different charge hence they will precipitate negatively charged sol i.e. 'A' with different flocculation value.

In second case the given compounds have similar cation but different anion with different charge. Hence they the will precipitate positively charged sol. i.e. 'B' with different flocculation value.

39. Aluminium is extracted from alumina ....

Sol. Na_3AlF_6, CaF_2 increase conductance and decrease M.P. of Al_2O_3.

40. Sulphur trioxide can be obtained ....

Sol. (I) $FeSO_4 \xrightarrow{\Delta} Fe_2(SO_4)_3 + SO_2 + SO_3$

(II) $Fe_2(SO_4)_3 \xrightarrow{\Delta} Fe_2O_3 + SO_3$

(III) $PCl_5 + SO_2 \xrightarrow{\Delta} POCl_3 + SOCl_2$

(IV) $H_2SO_4 + P_4O_{10} \xrightarrow{\Delta} HPO_3 + SO_3$

41. The spin only magnetic moment ....

Sol. $[Mn(CN)_6]^{3-}$: $Mn^{3+} = 3d^4, 4s^o = t_{2g}^{2,1,1}, e_g^{o,o}$

$= d^2sp^3$ hybridised no. of unpaired electrons = 2

$\sqrt{n(n+2)} = \sqrt{2 \times 4}$ BM = 2.8 BM

$[MnBr_4]^{2-}$: $Mn^{2+} = 3d^5, 4s^o = e_g^{1,1}, t_{2g}^{1,1,1}$

$= sp^3$ hybridised no. of unpaired electrons = 5

$\sqrt{n(n+2)} = \sqrt{5 \times 7}$ BM = 5.9 BM

42. AB crystallizes in a body centred ....

Sol. Distance between two oppositely charged ions in body centred cubic lattice $= \frac{\sqrt{3}}{2}a = \frac{\sqrt{3}}{2} \times 387 = 335.15$ pm

43. Following graph shows the relation ....

Sol. $\frac{\pi}{RT} = i.C$ i = slope

44. If 40 ml of 0.2 M CH_3COOH is ....

Sol. Quantity of acid initially $= \frac{40 \times 0.2}{1000} = 8 \times 10^{-3}$ mole

Buffer action will be maximum when

$\therefore$ pH = pK_a

$\Rightarrow$ quantity of salt = quantity of acid = 4×10^{-3} mole

This happens when acid is half neutralized i.e.

Now, quantity of salt formed = quantity of NaOH added

$= 4 \times 10^{-3}$ mole ...(i)

so molarity of NaOH = 0.2 M

$\frac{[Salt]}{[Acid]} = 1 \quad \therefore \quad n_{NaOH} = \frac{V \times 0.2}{1000}$ ....(ii)

from (i) & (ii)

V = 20 ml

45. Calculate the potential of hydrogen ....

Sol. $[OH^-] = 2 \times 5 \times 10^{-3} = 10^{-2}$ M , pOH = $-\log 10^{-2}$

pOH = 2 , pH = 12

$H^+ + e^- \longrightarrow \frac{1}{2}H_2$

$E_{red} = E^0_{red} - \frac{0.059}{1} \log \frac{(P_{H_2})^{1/2}}{[H^+]}$

$= 0 - \frac{0.059}{1} \log \frac{1}{H^+}$

$= -0.059 \times pH \qquad = -0.059 \times 12 = -0.708$ V

46. Calculate value of 'ℓn ....

Sol. $\Delta G^o = \Delta H^o - T\Delta S^o$

$\Delta H_r^o = (\Sigma \Delta_f H^o)_p - (\Sigma \Delta_f H^o)_R$

$= 2 \times (+40.407) - (+70)$

$= +10.814$ kJ

$\Delta G^o = +10.814$ kJ $- 250 \times 10$ J/K

$= +10.814$ kJ $- 2500$ J $= 8314$ J

$\Delta G^o = -RT \ell n K$

$8314 = -8.314 \times 250 \ell n K$

$\ell n K = -4.$

47. The Boyle temperature of a vander ....

Sol. $T_C = (8/27) \times T_B = (8/27) \times 27K = 8$ K

48. In $_{24}Cr$ in ground state electronic ....

Sol.

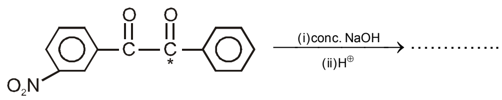
$_{24}Cr$	$1s^2$	$2s^2$	$2p^6$	$3s^2$	$3p^6$	$3d^5$	$4s^1$
n	1	2	2	3	3	3	4
l	0	0	1	0	1	2	0
m	0	0	(–1,0, +1)	0	(–1,0, +1)	(–2,–1,0, +1,+2)	0
n+l+m	1	2	(2,3,4)	3	(3,4,5)	(3,4,5, 6,7)	4

50. Which carbocation is most ....

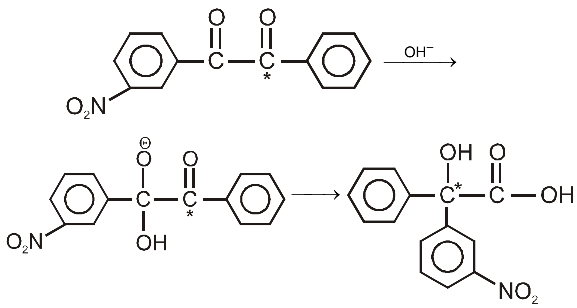
Sol. Aromatic

52. Which of the following compound ....

Sol. (2) Most e^- rich ring will show fastest rate towards electrophile.

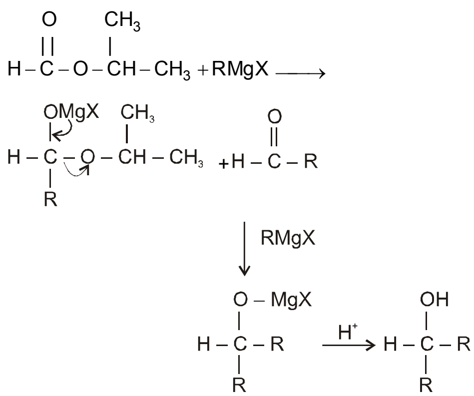
53. 

Sol. Benzil-belzilic acid rearrangement :

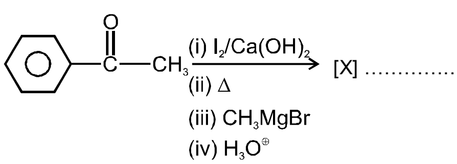


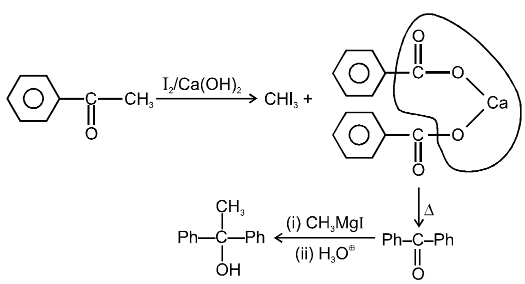
Nitro substituted benzene ring is more reactive for nucleophile.

56. When grignard reagent (excess) is ....

Sol. 

(2° Alcohol)

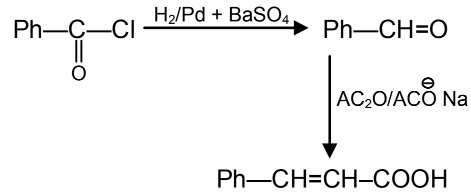
57. 

Sol. 

58. Which of the following sets ....

Sol. Adenine, guanine, cytosine sets of bases is present both in DNA and RNA.

59. In the reaction ....

Sol. 

PART-C : MATHEMATICS

61. If arg z = π / 4.................

Sol. arg z = π / 4 ⇒ $\tan^{-1}$ (y / x) = π /4

$\Rightarrow y/x = \tan(\pi/4) = 1$

i.e. y = x ⇒ $z^2 = x^2 - y^2 + i\,2xy = 0 + i\,2x^2$

∴ Re $z^2 = 0$

62. In an arithmetic............

Sol. Now $a_1^2 - a_2^2 = (a_1 - a_2)(a_1 + a_2) = -d(a_1 + a_2)$

$; a_3^2 - a_4^2 = -d(a_3 + a_4);$

$a_{2k-1}^2 - a_{2k}^2 = -d(a_{2k-1} + a_{2k})$;

Adding, we get $S = -d[a_1 + a_2 + ... + a_{2k}]$

$S = -d[S_{2k}] = -d.\dfrac{2k}{2}[a_1 + a_{2k}];$

$S = -dk(a_1 + a_{2k})$ ....(i)

Now $a_{2k} = a_1 + (2k-1)d$

or $\dfrac{a_1 - a_{2k}}{2k-1} = -d$

Putting the value of –d in (i), we get

$S = \dfrac{k(a_1 - a_{2k})}{2k-1}(a_1 + a_{2k}) = \dfrac{k}{2k-1}.(a_1^2 - a_{2k}^2)$

63. If the roots ....

Sol. We have $\dfrac{k+1}{k} + \dfrac{k+2}{k+1} = -\dfrac{b}{a}$ and $\dfrac{k+1}{k}.\dfrac{k+2}{k+1} = \dfrac{c}{a}$

OR $\dfrac{k+2}{k} = \dfrac{c}{a}$ or $\dfrac{2}{k} = \dfrac{c}{a} - 1 = \dfrac{c-a}{a}$

$\therefore k = \dfrac{2a}{c-a}$

Now eliminate k. Putting the value of k in 1st relation, we get

$\frac{c+a}{2a}+\frac{2c}{c+a}=-\frac{b}{a}$ or (c + a)^2 + 4ac

= –2b (a + c) or (a + c)^2 + 2b (a + c) = –4ac

Add b^2 to both sides. (a + c + b)^2 = b^2 – 4ac

64. The sum of ....

Sol. (x – 4)^2 = | x – 4|^2. Put | x –4 | = y

$\therefore$ y^2 – 8y + 15 = 0 or (y – 3) (y – 5) = 0

$\therefore$ |x–4|=3, or 5 Or x – 4 = 3, –3 or 5, –5

$\therefore$ x = 7, 1, 9, –1

$\therefore$ Sum = 16.

65. The set S : ....

Sol. We have 12 different objects which are to be divided into 3 groups of equal size, namely A, B and C.

$\therefore$ Number of ways = $\frac{12!}{(4!)^3 3!}x3!=\frac{12!}{(4!)^3}$

66. The number of ....

Sol. General term = $^{124}C_r\ 5^{\frac{124-r}{2}}\ 11^{\frac{r}{4}}$; r = 0, 4, 8, ...124

$\Rightarrow$ 32 terms

67. If A + B + C = π ....

Sol. Putting sin (A + B + C) = sin π = 0

and cos (A + B) = –cos C, it becomes a skew symmetric determinant of odd order whose value is zero.

68. If A= $\begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ then..................

Sol. Det A =14 by expansion

Adj (adj A) = | A |$^{n-2}$ A = 14A

$\therefore\ \ \text{Det}\{\text{adj}(\text{adj}A)\}=\text{Det}(|A|A)$

$=|A|^3\,\text{Det}A=|A|^3\,.\,|A|=|A|^4=14^4$

69. If $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, ...

Sol. $1+\alpha^2+\beta^2=3$ and $\vec{c}=l\vec{a}+m\vec{b}$

As $\vec{a},\vec{b},\vec{c}$ are linearly dependent.

On comparing coefficients, we get $l+4m=1=\beta,$

$\therefore \beta=1$ and hence $\alpha^2=1$ or $\alpha=\pm1.$

70. The vertices of ....

Sol. The internal bisector AD of angle BAC will divide the opposite side BC in the ratio of arms of the angle

i.e. AB : AC or $3\sqrt{2}:4\sqrt{2}$

or 3 : 4. Hence the point D on BC by ratio formula $\left(\frac{31}{7},1\right)$ is and A is (1, 1)

$\therefore$ Slope of AD = 0 .Hence slope of CL which is perpendicular from C on AD is not defined

$\therefore$ equation of CL is $\frac{y-5}{x-5}=\tan\theta=m=\infty$

$\therefore x-5=0$

71. 3x + 4y –7 = 0 is ....

Sol. Slope of tangent = –3/4 and hence slope of normal is 4/3 = tan θ

$\therefore\ \sin\theta=\frac{4}{5},\cos\theta=\frac{3}{5}$

$\frac{x-1}{\cos\theta}=\frac{y-1}{\sin\theta}=5,-5$ for C$_1$ and C$_2$

72. The equation ....

Sol. Any tangent to the parabola y^2 = 4x is y = mx + $\frac{1}{m}$ (a = 1)

Or m^{2}x – my + 1 = 0 Apply p = r the condition of tangency with given circle (3, 0), 3 $\frac{3m^2+1}{\sqrt{m^4+m^2}}=3$

or (3m^2 + 1)^2 = 9 (m^4 + m^2) or 3m^2 = 1

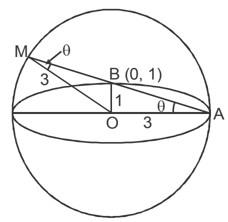
$\therefore m=\pm\frac{1}{\sqrt{3}}$

Since the tangent touches the parabola above x–axis it will make an acute angle with x–axis so that tan θ = m = +ive. Hence we choose

m = $\frac{1}{\sqrt{3}}$ $\quad\therefore x-\sqrt{3}y+3=0\Rightarrow$ (3)

73. The line passing..................

Sol. Ellipse is $\frac{x^2}{9}+\frac{y^2}{1}=1$



Auxiliary circle is $\frac{x^2}{9}+\frac{y^2}{9}=1$, Area of

$$\Delta OAM=\frac{1}{2}OA.\ OM\sin(\pi-2\theta)=\frac{1}{2}.3.3.\sin 2\theta$$

Where $\tan\theta=\frac{1}{3}$ from ΔAOB

$$\therefore \sin 2\theta=\frac{2t}{1+t^2}=\frac{2.\frac{1}{3}}{1+\frac{1}{9}}=2x\frac{3}{10}=\frac{3}{5}$$

$\therefore$ Area $=\frac{9}{2}.\frac{3}{5}=\frac{27}{10}$

74. There are n ………………

Sol. $P(E_i)$ = ki ; $\sum P(E_i)=1 \Rightarrow$ k = $\frac{2}{n(n+1)}$

$$\lim_{n\to\infty} P(w)=\lim_{n\to\infty}\sum_{i=1}^{n}\frac{2i^2}{n(n+1)^2}$$

$$=\lim_{n\to\infty}\frac{2n(n+1)(2n+1)}{n(n+1)^2 6}=\frac{2}{3}$$

75. A line passes ………………

Sol. Equation of the line AB through A by two points formula is

$$\frac{x-2}{6}=\frac{y+3}{2}=\frac{z-1}{3}$$

Now $\sqrt{6^2+2^2+3^2}=7$

$\therefore$ AB is $\frac{x-2}{6/7}=\frac{y+3}{2/7}=\frac{z-1}{3/7}=r$ Where r is the distance of any point P on the line from the point A.

But AP = $\pm 14=r$

$$\therefore x=2\pm\frac{6}{7}.14,-3\pm\frac{2}{7}.14,1\pm\frac{3}{7}.14$$

(14, 1, 5) or (–10,–7,–7)

76. The line ………………

Sol. Any point (3r + 2, 2r – 1, –r + 1) on the line will lie on the given curve if

z = 0 or –r + 1 = 0 $\therefore$ r = 1

Hence the point is (5, 1, 0). It will lie on xy = c^2, z = 0 if

5.1 = c^2

$$\therefore c=\pm\sqrt{5}.$$

77. Let $\left(1,\frac{1}{4}\right)$ be ………………

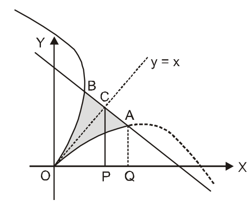
Sol. Let f(x) = ax^2 + bx

$\frac{1}{4}$ = a + b ....(1)

f′(x) = 2ax + b

2a + b = 0 ....(2)

From (1) and (2) ,



a = $-\frac{1}{4}$, b = $\frac{1}{2}$ f(x) = $\frac{2x-x^2}{4}$

Since 4x + 4y – 5 = 0 passes through A $\left(1,\frac{1}{4}\right)$ and B $\left(\frac{1}{4},1\right)$ so area bounded is

= 2[area (OCP) + area (CPQA) – OAQ]

$$=2\left[\frac{1}{2}\times\frac{5}{8}\times\frac{5}{8}+\left(\frac{5}{8}+\frac{1}{4}\right)\times\frac{1}{2}\times\left(1-\frac{5}{8}\right)-\int_0^1\frac{2x-x^2}{4}dx\right]$$

$$=2\left[\frac{25}{128}+\frac{7}{8}\times\frac{3}{16}-\frac{1}{6}\right]=\frac{37}{96}=A,\ 96A=37$$

78. If sin (x + 3a) ………………

Sol. sin x {cos 3a + 3 cos a} = cos x {3 sin a – sin 3a} or tan

$$x=\frac{4\sin^3 a}{4\cos^3 a}=\tan^3 a$$

79. Which cannot ………………

Sol. The given equation can be written as

$$9\cos^{12}x-6\cos^6 x(1+\cos 2x)+(1+\cos^2 2x+2\cos 2x)=0$$

or $(9\cos^{12}x-6\cos^6 x.2\cos^2 x)+(1+\cos 2x)^2=0$

$$(9\cos^{12}x-12\cos^8 x+(2\cos^2 x)^2=0$$

$$\cos^4 x(9\cos^8 x-12\cos^4 x+4)=0$$

or $\cos^4 x(3\cos^4 x-2)^2=0$

$$\therefore \cos x=0\Rightarrow x=n\pi+\frac{\pi}{2}\Rightarrow(a)\cos^2 x=\sqrt{2/3}=\cos^2\alpha,\text{say}$$

$$\therefore x=n\pi\pm\alpha=n\pi\pm\cos^{-1}\sqrt[4]{2/3}$$

80. A tree is broken………………

Sol. AC = 10 = AB

BC = BC = $\sqrt{(10^2+10^2)}=10\sqrt{2}$

$=AB+BC=10(\sqrt{2}+1)$

81. The minimum………………

Sol. f(x) = $\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^3 - 3\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right) - 4\left[\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2 - 2\right]$

Let $\sqrt{x}+\frac{1}{\sqrt{x}}$ = t (x > 0)

Let g(t) = $t^3 - 3t - 4t^2 + 8$

g′(t) = (t – 3) (3t + 1) = 0 ⇒ t = 3

g″(3) > 0 ⇒ g(3) = –10

82. The value of ………………

Sol. f (x + 1) –f (x) = 8x + 3

L.H.S. = b [(x + 1)^2 – x^2] + c [x +1 – x] + (d – d)

$\therefore 2bx + (b+c) = 8x+3$

$\therefore 2b = 8, b + c = 3$ etc.

83. If the sets A ………………

Sol. y = x and y = sin x intersect at only one point (0, 0)

⇒ A ∩ B is singleton set

84. $\lim_{x\to 0} f\left(\frac{1-\cos 3x}{x^2}\right)$,………………

$\lim_{x\to 0} f\left(\frac{1-\cos 3x}{x^2}\right)$, ………………

Sol. $\lim_{x\to 0}\frac{1-\cos 3x}{x^2} = \lim_{x\to 0}\frac{2\sin^2(3x/2)}{x^2} = 2.\frac{(3x/2)^2}{x^2} = \frac{9}{2}$

$\therefore \lim_{x\to 0} f\left(\frac{9}{2}\right) = \frac{2}{9}.$

85. For the curve ………………

Sol. $\frac{dy}{dx} = e^x(1+x) = 0 \Rightarrow x = -1$

$\frac{d^2y}{dx^x} = e^x(2+x) = +\text{ive for } x = -1$

86. A tangent is ………………

Sol. Tangent is $\frac{x\cos\theta}{3\sqrt{3}} + \frac{y\sin\theta}{1} = 1$; y = sum of intercepts

= $3\sqrt{3}\sec\theta + \text{cosec}\,\theta$ For min. $\frac{dy}{d\theta} = 0$

$\therefore 3\sqrt{3}\sec\theta\tan\theta - \text{cosec}\,\theta.\cot\theta = 0$

$\therefore \tan^3\theta = \frac{1}{3\sqrt{3}}$

$\therefore \tan\theta = \frac{1}{\sqrt{3}} \to \theta = \frac{\pi}{6}$

87. $\int_0^{\pi/4} \sec^2 x \sin x\, dx = \int_0^a \frac{dx}{\sqrt{x}+\sqrt{x+a}}$,………

Sol. L.H.S. = $\int_0^{\pi/4} \sec x \tan x dx = [\sec x]_0^{\pi/4} = (\sqrt{2}-1)$

R.H.S. = $\int_0^a \frac{(\sqrt{x}-\sqrt{x+a})}{x-(x+a)}dx = -\frac{1}{a}.\frac{2}{3}\left[x^{3/2} - (x+a)^{3/2}\right]_0^a$

= $-\frac{2}{3a}\left[\{a^{3/2} - (2a)^{3/2}\} - \{0 - a^{3/2}\}\right]$

$= -\frac{2}{3a}a^{3/2}\left[2 - 2\sqrt{2}\right] = \frac{4}{3}(\sqrt{2}-1)\sqrt{a}$,

By given condition $\frac{4}{3}(\sqrt{2}-1)\sqrt{a} = (\sqrt{2}-1)$

$\therefore \sqrt{a} = \frac{3}{4}$ or $a = \frac{9}{16}$

88. $\int_{\log 1/2}^{\log 2} \sin\left\{\frac{e^x-1}{e^x+1}\right\}dx$ ………

Sol. $I = \int_{\log 2}^{\log 2} \sin\left\{\frac{e^x-1}{e^x+1}\right\}dx$ If f (x) = $\sin\left(\frac{e^x-1}{e^x+1}\right)$

$f(-x) = \sin\left(\frac{1-e^x}{1+e^x}\right) = -\sin\left(\frac{e^x-1}{e^x+1}\right) = -f(x)$

Hence f(x) is an odd function of x

$\therefore I = 0$

MAJOR TEST (MT)

(JEE MAIN PATTERN)

TARGET : JEE (MAIN+ADVANCED) 2019

DATE : 03-03-2019 **COURSE : VIJAY(JR) & AJAY(ER)**

ANSWER KEY

CODE-1

PART-A (PHYSICS)

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

PART-B (CHEMISTRY)

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

PART-C (MATHEMATICS)

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

MAJOR TEST (MT)

(JEE MAIN PATTERN)

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DATE : 03-03-2019 **COURSE : VIJAY(JR) & AJAY(ER)**

ANSWER KEY

CODE-2

PART-A (MATHEMATICS)

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

PART-B (PHYSICS)

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

PART-C (CHEMISTRY)

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

MAJOR TEST (MT)

(JEE MAIN PATTERN)

TARGET : JEE (MAIN+ADVANCED) 2019

DATE : 03-03-2019 **COURSE : VIJAY(JR) & AJAY(ER)**

ANSWER KEY

CODE-3

PART-A (CHEMISTRY)

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

PART-B (MATHEMATICS)

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

PART-C (PHYSICS)

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