SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

JR MPC (BATCH-2) | **JEE MAINS MODEL WT-01** | **Date: 13-09-2020**

Time: 3 Hours | **Max. Marks: 300 M**

KEY SHEET

MATHEMATICS

1) **1**	2) **2**	3) **2**	4) **2**	5) **2**	6) **3**	7) **2**	8) **3**	9) **4**	10) **3**
11) **1**	12) **1**	13) **3**	14) **1**	15) **2**	16) **4**	17) **3**	18) **1**	19) **3**	20) **4**
21) **-5**	22) **4**	23) **3.2**	24) **30**	25) **3**					

PHYSICS

26) **1**	27) **2**	28) **4**	29) **2**	30) **3**	31) **2**	32) **2**	33) **2**	34) **1**	35) **3**
36) **2**	37) **1**	38) **1**	39) **1**	40) **1**	41) **3**	42) **2**	43) **2**	44) **2**	45) **4**
46) **3**	47) **0.5**	48) **5**	49) **6**	50) **3.10**					

CHEMISTRY

51) **1**	52) **3**	53) **1**	54) **4**	55) **3**	56) **3**	57) **1**	58) **4**	59) **2**	60) **3**
61) **3**	62) **1**	63) **1**	64) **4**	65) **3**	66) **2**	67) **2**	68) **3**	69) **2**	70) **3**
71) **4**	72) **246.9**	73) **0.527**	74) **4.035**	75) **500 nm**					

HINTS & SOLUTIONS

MATHEMATICS

1.

$$\frac{1}{CotA(1-CotA)}-\frac{Cot^2A}{(1-CotA)}$$

$$\frac{1-Cot^3A}{CotA(1-CotA}=\frac{Cot^2A}{(1-CotA)}$$

$$\Rightarrow 1+SecACoSecA$$

2.

$$CoS\theta+Sin\theta=P,\ \frac{Sin\theta}{CoS\theta}+\frac{CoS\theta}{Sin\theta}=q$$

$$\frac{1}{Sin\theta C\theta s\theta}=q\Rightarrow Sin\theta.CoS\theta=\frac{1}{q}$$

$$(SIn\theta+Cos\theta)^2=p^2$$

$$1+{}^{2}\!/_{q}=p^2 \qquad q(p^2-1)=2$$

3. $f_4(x)-f_6(x)=\frac{1}{4}\left[\sin^4x+\cos^4x\right]-\frac{1}{6}\left[\sin^6x+\cos^6x\right]$

$\Rightarrow$ 1/4-1/6

4. We have $\frac{3\pi}{4}<\theta<\pi$ and $\sqrt{2\cot\theta+\frac{1}{\sin^2\theta}}=k-\cot\theta$

$$2\cot\theta+\cos ec^2\theta=k^2+\cot^2\theta-2k.\cot\theta$$

$$2\cot\theta+1+\cot^2\theta=k^2+\cot^2\theta-2k.\cot\theta$$

$$2(1+k)\cot\theta=k^2-1$$

$$\cot\theta=\frac{k-1}{2}(or)\,k+1=0$$

$$k=-1$$

Now $\frac{3\pi}{4}<\theta<\pi$

$$-\infty<\cot\theta<-1\Rightarrow\frac{k-1}{2}<-1$$

$$\Rightarrow k<-1$$

5. $\sin^2\theta=\frac{c-b}{a-b}$, $\cos^2\theta=\frac{a-c}{a-b}$

$\tan^2\theta=\frac{c-b}{a-c}$

6. $$\frac{\tan(180^\circ-35)-\tan(90^\circ+35^\circ)}{1+\tan(180^\circ+35^\circ)\tan(90^\circ+35^\circ)}$$

$$\Rightarrow \frac{-k+1/k}{1-(-k).\frac{1}{k}} \Rightarrow \frac{1-k^2}{2k}$$

7. $\tan\theta<0 \Rightarrow \theta$ lies in II (or) IV quadrant

$\therefore \sin\theta>0 (or) \sin\theta<0$

8.

$A+B=90^0 \Rightarrow \sin^2 A+\sin^2 B=1$

$\left(\sin^2 5+\sin^2 85^0\right)+.....\left(\sin^2 40+\sin^2 50^0\right)$

$+\sin^2 45^0+\sin^2 90^0=8+\frac{1}{2}+1=\frac{19}{2}$

9. $x^4y^2=a^4(\sec\theta+\tan\theta)^8 b^2(\sec\theta-\tan\theta)^8$

$=a^4b^2$

10.

$$x+y=\frac{\sin^5 p+\cos^5 p}{\sin^2 p.\cos^2 p}$$

$$\Rightarrow \frac{\sin^3(1-\cos^2 p)+\cos^3 p(1-\sin^2 p)}{\sin^2 p.\cos^2 p}$$

$$\Rightarrow \frac{(\sin p+\cos p)^3-3\sin p\cos p(\sin p+\cos p)}{\sin^2 p.\cos^2 p}$$

$$x+y=\frac{79}{18}$$

11.

$\sin^2 A=\cos A.\cot A$

$\tan^6 A=1+\tan^2 A$

$1=\cot^6 A+\cot^4 A$

12.

$\alpha+\beta=90^\circ$ $\alpha-\beta=30^\circ$

$\alpha=60^\circ, \beta=30^\circ$

$\tan(\alpha+2\beta).\tan(2\alpha+\beta)$

$\tan(120^\circ)\tan(150^\circ)=1$

13. AB=BC

14. Ratio - 2 : 3

Take – 2 : -3

Harmonic conjugate $\left(\frac{14-6}{2-3},\frac{2+12}{2-3}\right)=(-8,-14)$

15.

$\frac{p+q+1}{3}=0 \Rightarrow p+q+1=0$

$\Rightarrow p^3q^3+1=3pq$

16. Δ^{1e} is right angled triangle

17.

$circum\ radius = \frac{OA.OB.AB}{2\left|x_1y_2-x_2y_1\right|}$

18. Apply incentre formula

19. Verification

20. Use distance formula

21. $A=\left[\frac{3k-5}{k+1},\frac{5k+1}{k+1}\right]$

22. $\left[\frac{\cos\theta+\sin\theta}{3},\frac{\sin\theta-\cos\theta}{3}\right] in\ y=2x$

23. The point

$R=(\alpha,0)\ lies\ on\ x-axis\ R\ divides\ PQ\ in\ the\ Ratio=-y_1:y_2=3:2$

$\alpha=\frac{mn_2+nx_1}{m+n}=\frac{3.4+2.2}{3+2}=\frac{12+4}{5}=\frac{16}{5}=3.2$

24.

$A=(4,-2),B=(-2,4),C=(5,5)$

$a=BC=5\sqrt{2}\left|b=CA=5\sqrt{2}\right|C=AB=6\sqrt{2}$

$\left[\frac{ax_1+bx_2+cx_3}{a+b+c},\frac{9y_1+by_2+cy_3}{a+b+c}\right]=\left[\frac{5}{2},\frac{5}{2}\right]$

25.

$P=(a,b)\ A=(6,-1)\ B=(2,3)$

$PA=PB$

$PA^2=PB^2$

$(a-6)^2+(b+1)^2=(a-2)^2(b-3)^2$

$8a-8b=24$

$a-b=3$

PHYSICS

26. $a=\frac{dv}{dt}$

27. $v=gt$

28. $v\alpha \tan\theta$

29. $h\alpha t^2$

30. 3 represents two dimensional motion

31. $t = \sqrt{\frac{2h}{g}} + \frac{h}{v_{sound}}$

32.

$v = \alpha\sqrt{x}$

$\frac{dx}{dt} = \alpha\sqrt{x}$

$\frac{dx}{\sqrt{x}} = \alpha dt$ by integrating $x\alpha t^2$

33.

$s_n = 0.4n + 9.8$

$s_n = 0.4n + 9.8 - \frac{0.4}{2} + \frac{0.4}{2}$

$s_n = 9.8 + \frac{0.4}{2} + 0.4n + \frac{0.4}{2}$

$s_n = 10 + 0.4\left(n - \frac{1}{2}\right)$

Compare with

$s_n = 4 + a\left(n - \frac{1}{2}\right)$

$\therefore 4 = 10m/s$

34.

$a = -2.5\sqrt{v}$

$\frac{dv}{dt} = 2.5\sqrt{v}$

$\left\{\frac{dv}{dt} = \{2.5dt\right.$

$2\sqrt{v} = 2.5t$

$2\sqrt{6.25} = 2.5t$

$t = 2\sec$

35.

$s_n = (0.36)h^2$

$g\left(n-\frac{1}{2}\right) = (0.3)\frac{gt^2}{2}$

$\frac{2n-1}{2} = \frac{36t^2}{100\times 2}$

$100(2n-1) = 36t^2$

$25(2n-1) = 36t^2$

$50n - 25 = 9t^2$

$9t^2 - 50n + 25 = 0$

$9t^2 - 50t + 25 = 0$

$t = \frac{50 \pm \sqrt{2500 - 4(25)9}}{18}$

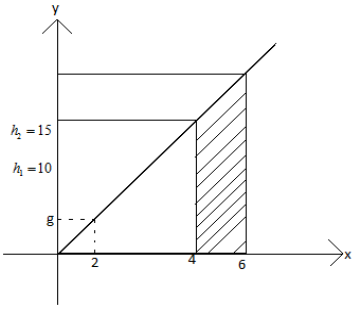
$t = \frac{50 \pm 40}{18}$

$t = \frac{98}{18} = 5\text{sec}$

$h = \frac{1}{2}gt^2 = 122.5m$

$V_{avg} = \frac{Total\ diplacement}{Total\ time} = \frac{Area}{time}$

36. $V_{avg} = \frac{\frac{1}{2}(10+15)\times 2}{2} = 12.5m$



$\left(Area\,of\ \ tapezoid = \frac{1}{2}(h_1+h_2)base = \frac{1}{2}(wt15)\times 2\right]$

37. $a = \frac{dv}{dt}, s = \frac{1}{2}at^2$

38. $h = \frac{1}{2}gt^2, h = g\left(n - Y_2\right)$

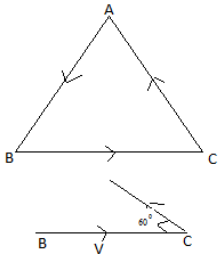
39.

$V_{res} = v + v\cos 60^0 = v + \frac{v}{2} = \frac{sv}{2}$

distance = speed $\times$ time

$x = \frac{3v}{2} \times t$

$t = \frac{2x}{3v}$



40. $v_{avg} = \frac{s_1 + s_2}{t_1 + t_2}$

41. $\Delta\bar{a} = \frac{\bar{v} - \bar{u}}{t}$

42. $\bar{a} = \frac{s_m^{th} - s_n^{th}}{m - n}$

43. $a = \frac{d^2 s}{dt^2}$

44. $a = \frac{\Delta v}{time}$

45. $s = ut + \frac{1}{2}at^2, s_n = 4 + \frac{9}{2}(2n-1)$

46.

$x^2 = at + 2bt + c$

$2xv = 2at + 2b$

$xv = at + b$

$v^2 + ax = a$

$ax = a - \left(\frac{at+b}{x}\right)^2$

$a = \frac{a\left(at^2 + 2bt + c\right) - \left(at+b\right)^2}{x^3}$

$a = \frac{ac - b^2}{x^3}$

$a \alpha x^{-3}$

47.

$v_x = 0.4m/s,\ v_y = at = 0.3$

$v = \sqrt{v_x^2 + v_y^2}$

48. $d = \frac{x}{n^2 - 1}$

49. Separation between do not change

50. $h=\frac{1}{2}gt^2 \quad -1$

$h-6=\frac{1}{2}g\left(t-0.2\right)^2 \quad -2$

$Solving\left(i\right)and\left(ii\right)we\,get, t=3.1\text{sec}$

CHEMISTRY

51. e/m for an electron is

$e/m=\frac{1.6\times10^{-19}c}{9.1\times10^{-28}gm}=0.175\times10^{9}c/gm$

52. Nitride ion N^{-3}

For $_7N^{14}$

No. of protons=Z=17

N^{-3} means gaining of 3 electrons

$\therefore Electrons=7+3=10$

53. IOS electrons species have same No. of electrons.

$CO=6+8=14\&C\overline{N}=6+7+1=14$

54.

$For\,K^{+}=19-1=180^{\circ},19\,protons$

$For\,Ca^{+2}=20-2=180^{\circ},20\,protons$

$For\,Sc^{+3}=21-3=180^{\circ},21\,protons$

55.

$Atomic\,mass=2Z+12$

$Electrons=Z$

$No.of\ Neutrons=A-Z=2Z+12-Z=Z=12$

$particles\,in\,HD^{+}\left[\begin{matrix}1\\1\end{matrix}H\ {}_1D^2\right]^{+}\Rightarrow\left[{}_2HD^3\right]^{+}$

$protons=Z=2, \quad electrons=2-1=1,$

56. $Neutrons=3-2=1$

$M^{+2}=2,8,14$

57. $_{26}Fe^{56}\Rightarrow no.of\ Neutrons=A-Z=56-26=30$

58.

Particle	Mass	e/m
Electron	$\frac{1}{18.37}$	$\frac{1}{1/18.37}=1837$
Proton	1	$\frac{1}{1}=01$
Neutron	1	$\frac{0}{1}=0$
$\alpha\left[He^{+2}\right]$	4	$\frac{2}{4}=0.5$

59.

$$E=\frac{nhc}{\lambda},\quad n=\frac{E\lambda}{hc}$$

$$=\frac{1\times6000\times10^{-10}}{6.6\times10^{-34}\times3\times10^{8}}=\frac{1}{3.3\times10^{-19}}=3\times10^{18}$$

60. $E=hu=6.62\times10^{-27}\times3\times10^{15}=2\times10^{-11}evgs$

$$E=\frac{hc}{\lambda},\lambda=\frac{6.6\times10^{-27}\times3\times10^{10}}{5\times10^{-11}}$$

61. $=400A^{0}$

62.

$$E=hu=\frac{hc}{\lambda}\Rightarrow hc\bar{u}\Rightarrow\bar{u}=\frac{\in}{hc}$$

$$\bar{u}=\frac{1}{662\times10^{-17}\times3\times10^{10}}=5\times10^{15}cm^{-1}$$

63. Conceptual

$v=nc$

$where\, n=No.of\ electrons$

64. $4.8\times10^{-19}C=n\times1.6\times10^{-19}C\Rightarrow n=3$

65. Conceptual

66. Conceptual

67.

$$m=\frac{e}{(e/m)}$$

$but\, e/m\, of\ particle\, is\, half\ of\left(\frac{c}{m}\right)of\ proton.$

$$\Rightarrow\frac{e}{(e/m)}=\frac{3.2\times10^{-19}C}{\frac{0.956}{2}\times10^{8}C}=6.69\times10^{-27}kg$$

68. Conceptual

69. Conceptual

70.

$$E = \frac{hc}{\lambda} = 3 \times 1.6 \times 10^{-12} = \frac{6.626 \times 10^{-27} \times 3 \times 10^{10}}{\lambda}$$

$$\lambda = \frac{6.626 \times 10^{-17}}{1.6 \times 10^{-12}} = \lambda = 4.14125 \times 10^{-5} cm$$

$$\lambda = 414125 A^0$$

71.

$$Q = ne, n = \frac{Q}{e} = \frac{6.39 \times 10^{-19} C}{1.602 \times 10^{-19} C} = 4$$

72.

$$E = \frac{hc}{\lambda} = \frac{6.6 \times 10^{-34} \times 3 \times 18^8}{484 \times 10^{-9}} = 0.0409 \times 10^{-17}$$

$$E = 4.09 \times 10^{-19}$$

$$E = 4.09 \times 10^{-19} 6.023 \times 10^{23}$$

$$E = 246.9$$

73.

$$No. of\ Neutrons = 14 - 6 = 8$$

$$No. of\ Neutrons\ in\ 7mg\ of\ C^{14} = \frac{7 \times 10^{-3}}{14} \times 6.023 \times 10^{23} \times 8$$

$$= 2.408 \times 10^{21}$$

$$Total\ mass\ of\ neutrons\ in\ 7mg\ of\ C^{14}$$

$$= 2.4088 \times 10^{21} \times 1.675 \times 10^{-27}$$

$$= 4.635 \times 10^{-6} kg$$

74.

75.