SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC (BATCH-2)
Time: 3 Hours

JEE MAINS MODEL WT-1

Date: 13-09-2020

KEY SHEET

MATHS

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

PHYSICS

26) **4**	27) **1**	28) **3**	29) **3**	30) **2**	31) **3**	32) **1**	33) **2**	34) **3**	35) **2**
36) **3**	37) **3**	38) **4**	39) **2**	40) **3**	41) **1**	42) **1**	43) **4**	44) **3**	45) **4**
46) **10**	47) **2**	48) **2**	49) **0.5**	50) **2.21**					

CHEMISTRY

51) **4**	52) **4**	53) **1**	54) **1**	55) **2**	56) **3**	57) **4**	58) **2**	59) **2**	60) **1**
61) **3**	62) **3**	63) **1**	64) **1**	65) **3**	66) **2**	67) **1**	68) **4**	69) **4**	70) **1**
71) **1**	72) **62**	73) **0.998**	74) **0.5**	75) **0.02**					

HINTS & SOLUTIONS

MATHS-IIA

MATHS-IIA

1. $1-x+6x^2 = A\left(1-x^2\right)+Bx\left(1+x\right)+Cx\left(1-x\right)$

Comparing constants we get A=1

2. $x^2+1=\left(Ax+B\right)\left(x-2\right)+C\left(x^2+4\right)$

Comparing we get A,B,C

3. $x^2-1=A\left(x^2+1\right)+\left(Bx+C\right)x$

Comparing we get A,B,C

4. $\left(x-1\right)^2=A\left(x^2+1\right)+\left(Bx+C\right)x$

Comparing we get A,B,C

5. **put x-1 = t**

6. $f\left(1\right)=2,\ f\left(2\right)=3$

$f\left(x\right)=q\left(x\right)\left(x-2\right)\left(x-3\right)+ax+b$

Sub x=1,2 we get the values of a,b

7. $x=A\left(x-3\right)+B\left(x-2\right)$

$$\frac{x}{\left(x-2\right)\left(x-3\right)}=\frac{-2}{x-2}+\frac{3}{x-3}=\frac{-2}{-2\left(1-\frac{x}{2}\right)}+\frac{3}{-3\left(1-\frac{x}{3}\right)}$$

8. **Roots are 1+i, 1-i**

Equation is $x^2-\left(1+i+1-i\right)x+\left(1+i\right)\left(1-i\right)=0$

9. $$\left(\frac{\alpha}{\beta}-\frac{\beta}{\alpha}\right)^2=\left(\frac{\alpha^2-\beta^2}{\alpha\beta}\right)^2=\frac{\left(\alpha+\beta\right)^2\left(\alpha-\beta\right)^2}{\alpha^2\beta^2}$$

$$=\frac{\left(\alpha+\beta\right)^2\left(\left(\alpha+\beta\right)^2-4\alpha\beta\right)}{\left(\alpha\beta\right)^2}$$

10. $3\alpha^2+5\alpha-7=0\Rightarrow\left(3\alpha+5\right)\alpha=7\Rightarrow\frac{1}{3\alpha+5}=\frac{\alpha}{7}$

$$\Rightarrow\frac{1}{\left(3\alpha+5\right)^2}+\frac{1}{\left(3\beta+5\right)^2}=\left(\frac{\alpha}{7}\right)^2+\left(\frac{\beta}{7}\right)^2$$

11. $$\int\frac{1+x^2+x^2}{x^2\left(1+x^2\right)}dx=\int\frac{1}{x^2}+\frac{1}{\left(1+x^2\right)}dx$$

12. **Ratioanalize denominator**

13. **Put** $Sin^{-1}x=t$

14. $\cos 7x\cos 3x=\frac{1}{2}\left(\cos 10x+\cos 4x\right)$

15. **Put** $Tan^{-1}\left(\frac{x^2+1}{x}\right)=t$

16. **Put** $\log\left(\log x\right)=t$

17. **Put** $xe^x=t$

18. $$\frac{1}{\sin\left(b-a\right)}\int\frac{\sin\left(\left(x-a\right)-\left(x-b\right)\right)}{\sin\left(x-a\right)\sin\left(x-b\right)}dx$$

19. $\int \frac{\left(1+\sqrt{x}\right)\left(1+\sqrt[4]{x}\right)\left(1-\sqrt[4]{x}\right)}{1-\sqrt[4]{x}}dx$

20. **Put** $x^2=\sin\theta$

21. $x^3+x^2+1=(Ax+B)\left(x^2+3\right)+(Cx+D)\left(x^2+2\right)$

Comparing we get A,B,C,D

22. $x^2+5=\left(x^2+2\right)+k$

23. $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta=(a-2)^2+2(a+1)=a^2-2a+6$

$f(a)=a^2-2a+6\Rightarrow f^1(a)=2a-2=0\Rightarrow a=1$

24. $\int\frac{dx}{\sqrt{\sin^3 x\cos x}}=\int\frac{dx}{\sqrt{\sin^4 x\cot x}}=\int\frac{\cos ec^2 x}{\sqrt{\cot x}}dx$

25. $\frac{2}{3}<x<1\Rightarrow 2<3x<3\Rightarrow -3<-3x<-2$

$\Rightarrow 2<5-3x<3\Rightarrow[5-3x]=2$

PHYSICS

26. **Mechanical waves have different speed in different medium**

27. $V=\frac{w}{k}\left(\because w=\frac{2\pi}{T}\right)$

28. **Medium must possess elasticity of shape**
i.e., Shearing strain

29. **Wave travels in a transverse wave, particles of the medium vibrate perpendicular to the direction of wave propagation i.e., angle =** 90^0 *or* $\frac{\pi}{2}$ **radians**

30. **Time period between two successive trough or crest is T**
Time taken between trough to its 3rd trough = 2T

31. $\frac{P}{\rho}$ **= constant**

Pressure does not effect the velocity of sound

32. $Y=2\cos\left((6.284)330t-(6.284)x\right)$

Compare with $Y=A\cos(\omega t-kx)$

Then $\omega=(6.284)330$

$T=\frac{2\pi}{\omega}$

33. $Y=0.6\sin 2\pi\left(t-\frac{x}{2}\right)$

Compare with $Y=A\sin(\omega t-kx)$

Then A = 0.6

On reflecting $A^1=\left(\frac{2}{3}\right)0.6=0.4$

Reflected wave equation becomes $Y=-0.4\sin 2\pi\left(t+\frac{x}{2}\right)$

34. $t = 2\sqrt{\frac{\ell}{g}}$

35. $n = \frac{V}{2\ell}$

36. $V = \sqrt{\frac{T}{As}}$

37. $T = M_1 g \sin 30^0$

$T = \frac{M_1 g}{2}, T = M_2 g$

$\Rightarrow M_1 = 2M_2$

$V = \sqrt{\frac{T}{\mu}} \Rightarrow T = 98N$

Sub T in $T = M_2 g \Rightarrow M_2 = 10kg$

$\therefore M_1 = 20kg$

38. $\lambda = VT$

$\Delta\phi = \frac{2\pi}{\lambda}(\Delta x)$

39. $V = \sqrt{\frac{Y}{s}}$

$t = \frac{S}{V}$

40. $V_{rms} = \sqrt{\frac{3}{8}} V_{sound}$

41. $\Delta\phi = \frac{2\pi}{\lambda}(\Delta x)$

42. $V = \sqrt{\frac{K}{s}}$

43. $\Delta\phi = \frac{2\pi}{\lambda}(\Delta x)$

44. $V\alpha\sqrt{\frac{\gamma}{M}} \Rightarrow \frac{V_{N_2}}{V_{He}} = \sqrt{\frac{^8N_2}{8_{He}}} \times \frac{M_{He}}{M_{N_2}}$

45. **G.T, n=54 waves/min = 54/60 waves/sec**

$V = n\lambda$

46. $Y = 5\left(\sin 4\pi t + \sqrt{3}\cos 4\pi t\right) = 10\sin\left(4\pi t + \frac{\pi}{3}\right)$

Amplitude is 10

47. $Y = 3\sin\left(3t + 0.18x + \frac{\pi}{4}\right)$

$Y = A\sin(\omega t + kx + \phi)$

$V = \frac{\omega}{k}$

48. $V = \sqrt{\frac{Y}{\rho}} \Rightarrow V\alpha\frac{1}{\sqrt{\rho}} \Rightarrow \frac{V_2}{V_1} = \sqrt{\frac{\rho_1}{\rho_2}} = 2$

49. $\mu = \frac{M}{\ell}$ *and* $V = \sqrt{\frac{T}{\mu}}$

And $t = \frac{\ell}{V}$

50. $t = 2\sqrt{\frac{\ell}{g}}$

CHEMISTRY

51. **A mixture of salt & water forms a solution**
It can be separated by special methods like crystallization, distillation, etc

52. $M = \frac{n}{v}$

$D = M \times v$

53. **w=5.3g**
Vol. of solution = 250ml
GEW of $Na_2CO_3 = 53$

$N = \frac{w}{GEW} \times \frac{1000}{v}$

54. **Eq. Wt of** $H_3PO_2 = \frac{Mol.Wt}{Basicity}$

55. $0.98\%(w/v)$ H_2SO_4 **means 0.98g of** H_2SO_4 **is present in 100ml of the solution**
Eq. Wt of H_2SO_4 **= 98/2**

$N = \frac{w}{GEW} \times \frac{1000}{100}$

56. **Molarity(M) is temperature dependent**
Molality(m) is independent of temperature

57. **No. of moles of sucrose =** $\frac{3.42}{342} = \frac{1}{100}$

No of moles of water $= \frac{90}{18} = 5$

Mole fraction of sucrose $= \frac{n_{solute}}{n_{solute} + n_{solvent}}$

58. $Eq.Wt\ of\ CaCO_3 = \frac{Mol.wt}{change\ on\ cation(or)anion}$

59. $N = \frac{w}{GEW} \times \frac{1000}{V(ml)}$

$N_1V_1 = N_2V_2$

60. **Solution of salt in water has lower vapour pressure hence higher is it's B.P**

61. **Vapour pressure of a liquid varies exponentially with Temp.**

62. **Raoult's Law : The relative lowering of vapour pressure of a solution is equal to the mole fraction of the solute**

63. $M = \frac{\% \times d \times 10}{GMW} = \frac{w \times d \times 10}{m}$

65. **Solubility of** CO_2 **in soft drinks is based on Henry's law**
It is an application of Henry's law

66. **Camphor in air is a good example for solid in gas type solution**

67. $P_4 \rightarrow \overset{-3}{P}H_3 + H_2\overset{+2}{P}O_2$

Eq. wt of oxidizing agent or reducing agent $= \dfrac{Mol.Wt}{change\ in\ oxidation\ state}$

68. **Mole fraction have no units because it is a relative quantity**

69. **Nacl undergoes dissociation. Hence Raoult's law is not applicable**

70. **The respiratory device of scuba divers contains a mixture of** He, O_2 & N_2

71. $M = \dfrac{Mil\lim oles\ \ of\ \ solute}{Volume\ in\ ml}$

72. $H_2CO_3 + NaOH \rightarrow NaHCO_3 + H_2O$

In the above equation only one hydrogen is replaced

Hence Eq. Wt of $H_2CO_3 = \dfrac{Mol.Wt}{1}$

73. $\chi_{solute} = \dfrac{m}{m + \dfrac{1000}{M.Wt\ of\ \ solvent}}$

74. **For any solution the sum of mole fractions of all components should be equal to unity**

75. $\chi_{solute} = \dfrac{P^c - P}{P^c}$