# SRIGAYATRI EDUCATIONAL INSTITUTIONS

**INDIA**

**OUTGOING SR MPC** | **JEE MAINS GT- 11** | **Date: 30-07-2020**

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

## KEY SHEET

## MATHS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | **2** | 2 | **3** | 3 | **3** | 4 | **1** | 5 | **4** |
| 6 | **1** | 7 | **3** | 8 | **2** | 9 | **4** | 10 | **2** |
| 11 | **1** | 12 | **2** | 13 | **2** | 14 | **3** | 15 | **2** |
| 16 | **3** | 17 | **1** | 18 | **4** | 19 | **4** | 20 | **3** |
| 21 | **3** | 22 | **6** | 23 | **2** | 24 | **8.33** | 25 | **1** |

## PHYSICS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 26 | **3** | 27 | **2** | 28 | **4** | 29 | **2** | 30 | **4** |
| 31 | **1** | 32 | **4** | 33 | **3** | 34 | **2** | 35 | **4** |
| 36 | **4** | 37 | **2** | 38 | **4** | 39 | **2** | 40 | **4** |
| 41 | **2** | 42 | **1** | 43 | **1** | 44 | **4** | 45 | **3** |
| 46 | **0.8** | 47 | **2** | 48 | **7** | 49 | **66.6** | 50 | **2.25** |

## CHEMISTRY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 51 | **3** | 52 | **3** | 53 | **2** | 54 | **1** | 55 | **2** |
| 56 | **1** | 57 | **4** | 58 | **1** | 59 | **1** | 60 | **3** |
| 61 | **4** | 62 | **3** | 63 | **4** | 64 | **3** | 65 | **3** |
| 66 | **1** | 67 | **3** | 68 | **3** | 69 | **2** | 70 | **3** |
| 71 | **17** | 72 | **93.5** | 73 | **2.5** | 74 | **1** | 75 | **16** |

**SOLUTIONS**

**MATHS**

1. $$\int \frac{\frac{2}{x^2}+\frac{1}{x^{3/2}}}{\left(\frac{1}{x}+\frac{1}{\sqrt{x}}+1\right)^2}dx$$

$$\frac{1}{x}+\frac{1}{\sqrt{x}}+1=t \Rightarrow \left(-\frac{1}{x^2}-\frac{1}{2x^{3/2}}\right)dx=dt$$

2. $$\lim_{t\to x}\frac{t^3 f(x)-x^3 f(t)}{t^2-x^2}=\frac{1}{2} \Rightarrow 3xf(x)-x^2 f'(x)=1$$

$$\Rightarrow \frac{dy}{dx}-\frac{3y}{x}=\frac{-1}{x^2} \Rightarrow y=\frac{1}{4x}+\frac{3}{4}x^2 \qquad (\because f(1)=1)$$

3. Given equation becomes

$$x^2-3x+2=0$$

4. $$\sum_{k=0}^{100} {}^{100}C_k (x-2)^{100-k}\cdot 3^k=(x+1)^{100}$$

The coefficient of $x^{50} = {}^{100}C_{50}$

5. Coefficient of $x^{60} = -6+5+8-6=1$

6. $E_1 \rightarrow$ be the event of both getting the correct answer

$E_2 \rightarrow$ both getting the wrong answer.

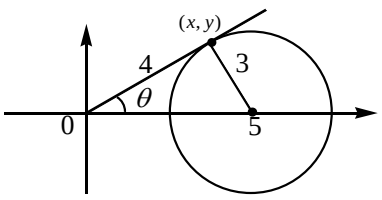
$E \rightarrow$ both obtaining same answer.

$$P(E_1)=\frac{1}{8}\frac{1}{12}=\frac{1}{96}, P(E_2)=\left(1-\frac{1}{8}\right)\left(1-\frac{1}{12}\right)=\frac{77}{96}$$

$$P\left(\frac{E}{E_1}\right)=1; \qquad P\left(\frac{E}{E_2}\right)=\frac{1}{1001}$$

$$P\left(\frac{E_1}{E}\right)=\frac{1.\frac{1}{96}}{1.\frac{1}{96}+\frac{1}{1001}.\frac{77}{96}}=\frac{13}{14}$$

7. $$\frac{y}{x}=\tan\theta=\frac{3}{4}$$



8. $t_2 = -t_1 - \frac{2}{t_1}$

$h = \frac{t_1^2 + t_2^2}{2}$ and $k = \frac{2t_1 + 2t_2}{2}$

Put the value of $t_2$ and eliminate $t_1$ we get

$h - 2 = \frac{4}{k^2} + \frac{k^2}{2} \Rightarrow a = 2, b = 4, c = 2$

9. $a + 6d, a + 10d$ , a+12d are in AP

(A) (B) (C)

And $B^2 = AC \Rightarrow$ a=-14d $\frac{c}{a} = \frac{1}{4}$

10. $f(x) = 1. y = x + 1$

11. Conceptual

12. Conceptual

13. $\sum_{i=1}^{n} X_i = n$

S.D = $\sqrt{\frac{\sum xi^2}{n} - 1} = \sqrt{5}$

14. $S = 1(3) + 2(5) + 3(7) + \_\_\_\_\_ + 44(89)$

$\sum_{k=1}^{44} k(2t+1)$ = 59730

15. $f(x) = 1 + \frac{x^2}{2}$ $x > 2$

$= 5x - t$ $x \varepsilon 2$

$f^1(2+) = 2$

$f^1(2-) = 5$

16. $\Delta = e^{i(A+B+C)}\Delta_1$

$\Delta_1 = \begin{pmatrix} 1 & -1 & -1 \\ -1 & 1 & -1 \\ -1 & -1 & 1 \end{pmatrix} = 4$

17. Conceptual

18. $x = \frac{n\pi}{6} \Rightarrow \frac{\pi}{3}, \frac{2\pi}{3}$

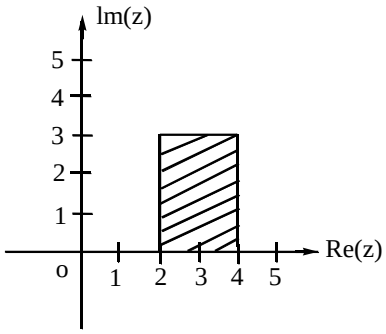
19. Centroid of $\overline{OPQ}$ is T

20. $\bar{a}+\bar{b}+\bar{c}=0 \quad \left|2\bar{a}+7\bar{b}+7\bar{c}\right|=\left|-5\bar{a}\right|=5$

21. $L=\sum_{r=1}^{n}\frac{2.r+n}{r^2+n.r+n^2}=\int_0^1\frac{(2x+1)dx}{x^2+x+1}=\ln\left(x^2+x+1\right)\ \Big|_0^1$

$L=\ln 3$

22.




23. $\therefore \text{let } f\left(x\right)=\left|x-a\right|+\left|x-b\right|$

Suppose $a>b$

$\therefore\ f(0)=f\left(1\right)=f\left(-1\right)$

$f\left(x\right)=$ constant in [b,$a$]

So, $b\le -1<a\le 1$

$a-b\le 2$

$\therefore \text{minimum}\left|a-b\right|=2$

24. The equation of normal at $\left(2\sec\theta,\tan\theta\right)$ is $2x\cos\theta+y\cot\theta=5$

Equal intercepts $\Rightarrow \sin\theta=\frac{1}{2}$

Also touches ellipse $\Rightarrow a^2+b^2=\frac{25}{3}\because c^2=a^2m^2+b^2$

25. Conceptual

## PHYSICS

26. $S_t=\frac{g}{2}\left(2t-1\right)=\frac{1}{2}g\left(3\right)^2$

$\Rightarrow t=5,\ then\ h=\frac{1}{2}g\left(5\right)^2=125m$

27. $V_A=\left(\frac{m_A-m_B}{m_A+m_B}\right)U_A;V_B=\left(\frac{2m_A}{m_A+m_B}\right)U_A$

But, $V_A=-V_B,\ then\ 3m_A=m_B$

28. $I_{AA^1} = \frac{2}{5}MR^2 - \frac{2}{5}\left(\frac{M}{8}\right)\left(\frac{R}{2}\right)^2 = \frac{2}{5}MR^2.\left(\frac{31}{32}\right)$

$I_{BB^1} = \frac{2}{5}MR^2 - \frac{7}{5}\left(\frac{M}{8}\right)\left(\frac{R}{2}\right)^2 = \frac{57}{160}MR^2$

29. $\frac{-GMm}{(R+R)} + 0 = \frac{-GMm}{R} + \frac{1}{2}mv^2$

30. Amplitude should be maximum under resonance condition

31. $\frac{F}{A} = \frac{m(g+a)}{\pi r^2}$

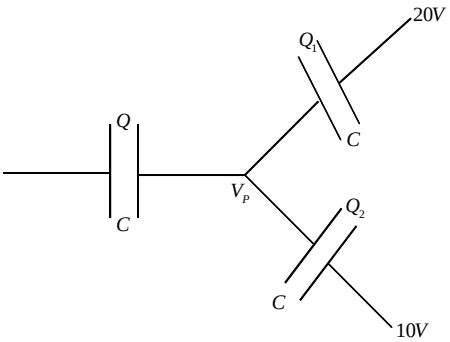
32. $\tan\theta = \frac{a}{g}$ ,but $\tan\theta = \frac{h}{L}$

33. $\lambda T$ =constant

34. $\Delta V = 0$ , $\therefore \Delta W = 0$

35. $= I_0 COS^2\left[\frac{\theta}{2}\right]$; $\theta = \frac{2\pi}{\lambda} \times \frac{\lambda}{6} = 30^0$

36.




$30 - V_P = \frac{Q}{C}$

$V_P - 20 = \frac{Q_1}{C}$ , $V_P - 10 = \frac{Q_2}{C}$

but $Q = Q_1 + Q_2$ ,then $V_P = 20$ volt.

37. Potential gradient $= I\rho'$

$= neAv_d\rho'$

$\propto v_d$

38. $F = q\vartheta\beta$ but $\frac{1}{2}mv^2 = qV$ ,then $F\alpha\sqrt{V}$

39. $\chi_m = \mu_r - 1$

40. Along any direction of motion, the direction of area vector is perpendicular to $\vec{B}$. So induced e.m.f will be zero

41. $V_c = IX_c$ where $X_c = \dfrac{1}{\omega c}$

42. $\dfrac{1}{\lambda} = R\left[\dfrac{1}{2^2} - \dfrac{1}{3^2}\right]$

$\lambda = \dfrac{36}{5} \times \dfrac{1}{R}$

Now, shortest wavelength of lyman series

$\dfrac{1}{\lambda^1} = \left[R\dfrac{1}{1^2} - \dfrac{1}{(\infty)^2}\right] = R \Rightarrow \lambda^1 = \dfrac{1}{R}$

$= \dfrac{5\lambda}{36}$

43. $N = N_0 e^{-\lambda t}$ where $\lambda = \dfrac{\log e^2}{T}; t = \dfrac{T}{2}$ then $N = \dfrac{N_0}{\sqrt{2}}$

44. $I_C = \dfrac{0.5}{800} = \dfrac{1}{16} \times 10^{-3}; \alpha = \dfrac{I_C}{I_E}$

Now, $I_B = I_E - I_C$

$= \dfrac{I_C}{\alpha} - I_C = I_C\left(\dfrac{1}{\alpha} - 1\right)$

$= = 26 \times 10^{-6} A$

45. $h = \dfrac{\lambda}{4} \Rightarrow \dfrac{C}{4n} = \dfrac{3 \times 10^8}{4 \times 10^6} = 75m$

46. N= $\dfrac{t}{N} \rightarrow \dfrac{\Delta T}{T} \times 100 = \dfrac{\Delta t}{t} \times 100 = \dfrac{15}{25} \times 100 = 0.8\%$

47. $\tan\alpha = \dfrac{V_y}{v_x} \rightarrow \tan 45^0 = \dfrac{u\sin\theta - gt}{u\cos\theta}$ and $t_a = \dfrac{u\sin\theta}{g}$

48. $F < \mu mg$ , so body is at rest , friction =F=7N .

49. $3 \times \dfrac{\vartheta}{4l_c} = 2 \times \dfrac{\vartheta}{2l_0}$

50. $V = \dfrac{1}{\sqrt{\mu \in}} = \dfrac{1}{\sqrt{\mu_0 \in_0}} \times \dfrac{1}{\sqrt{\mu_r \in_r}} = C \times \dfrac{1}{\sqrt{\mu_r \in_r}}$

## CHEMISTRY

51. $X_2O$ has $X : O :: 14 : 16$

Atomic mass of X:7

52. Both $HgCl_2$ *and* $C_2H_2$ are linear like $CO_2$ because of sp-hybridization.

53. $u_{AV}=(O_2)=\sqrt{\frac{8RT}{\pi\times 32}};\mu_{rms}(N_2)=\sqrt{\frac{3RT}{28}}$

$$\frac{u_{AV}(O_2)}{u_{rms}(N_2)}=\sqrt{\frac{8\times 28}{\pi\times 32\times 3}}=\sqrt{\frac{7}{3\pi}}$$

54. $H_2O_2$ is more associated liquid, diamagnetic and form blue $CrO_5$ with acidified $K_2Cr_2O_7$

$$K_2Cr_2O_7+H_2SO_4\rightarrow 2CrO_5+K_2SO_4+5H_2O$$

55. Density= $\frac{Z\times M}{a^3\times N_0}(Z=1,\ for\ M_{caBr}=213)$

$$a=436.6\times 10^{-12}m=4.366\times 10^{-10}m=4.366\times 10^{-8}cm$$

$$\text{Density}=\frac{1\times 213}{\left(4.366\times 10^{-8}\right)^3\times 6.02\times 10^{-23}}=4.25g/cm^3$$

No doubt for bcc $Z=2$, but in $CsBr$ it is 8:8 co-ordination and here one $Cs^+$ ion is present in body centre and a net contribution of 1 $Br^-$ per unit cell is calculated due to its presence at the corners.

56. $E^0_{cu^{2+}|Cu}=0.34$

$$E^0_{cu^{2+}|Cu}=E^0_{cu^{2+}|Cu}-\frac{0.0591}{2}\log\frac{1}{Cu^{2+}}$$

$$=\left(0.34+\frac{0.0591}{2}\right)V$$

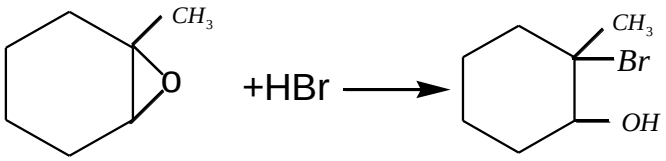
57. B in $BCl_3$ is $sp^2-$hybridised, N in $NCl_3$ has $sp^3-$hybridisation with one lone pair of electrons

58. $2KI+H_2O+O_3\rightarrow 2KOH+O_2+I_2$

59. $CH_3CH=NOH\xrightarrow{P_2O_5}CH_3CN$

60. Conceptual

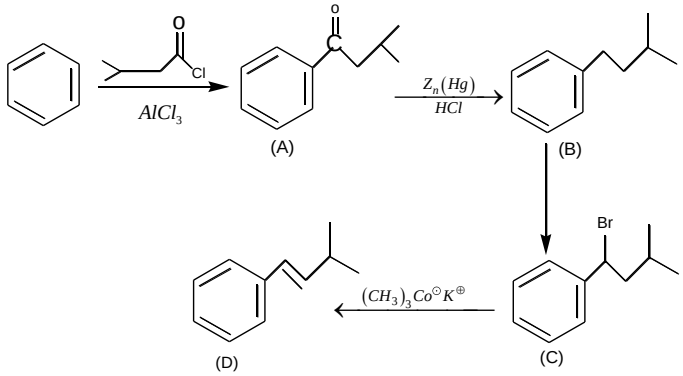
61. An electron attaching group $(-NO_2)$ disperses the negative charge on phenoxide ion and thus, makes it more stable or increases the acidic character of phenol. The substitution is more effective at P-position than in the m-position as the former involves a resonating structure bearing negative charge on the carbon attached to the electron withdrawing group. Also presence of electron repelling gp. $(-CH_3)$ intensifies the negative charge on phenoxide ion and thus, makes phenol less acidic .

62. 


This is acid catalysed cleavage of cyclic ether where nucleophile attackers most substituted carbon

63. Conceptual

64. Conceptual

65. 


66. $6XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$

67. Conceptual

68. Conceptual

69. Conceptual

70. Conceptual

71. $\mu_m = \bar{\delta} \times d$

$0.816 \times 10^{-18} = \delta \times 10^{-8}$

$\delta = 0.816 \times 10^{-10} esu$

$$\%\text{ionic character} = \frac{0.816 \times 10^{-10}}{4.803 \times 10^{-10}} \times 100 = 16.9\%$$

72. $$\frac{Mass\ of\ B_2H_2\ ptCl_6}{2B + 410} = \frac{Mass\ of\ pt}{195}$$

$$\frac{0.75}{2B + 410} = \frac{0.245}{195}$$

$B = 93.5$

Eq. mass of base=93; since it is monoacidic

Molar mass of base $= 93.5 \times 1 = 93.5$

73. $-\Delta G = nEF$

$-966 \times 10^3 = 4 \times E \times 96500$

$E = -2.5V$

Thus, an e.m.f of +2.5 is needed to carryout the electrolytic reduction of $Al_2O_3$

74. Integrated rate expression for ½ order is $-2c^{1/2} = Kt - 2c_0^{1/2}$

75. Conceptual