# Sri Chaitanya IIT Academy.,India.

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A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

SEC: Sr.Super60_STERLING BT | JEE-MAIN | Date: 02-08-2025
Time: 09:00AM to 12:00PM | QMT-13 | Max. Marks: 300

## KEY SHEET

## MATHEMATICS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | **4** | 2 | **2** | 3 | **2** | 4 | **3** | 5 | **3** |
| 6 | **1** | 7 | **2** | 8 | **3** | 9 | **3** | 10 | **2** |
| 11 | **1** | 12 | **3** | 13 | **2** | 14 | **3** | 15 | **1** |
| 16 | **3** | 17 | **1** | 18 | **4** | 19 | **3** | 20 | **1** |
| 21 | **11** | 22 | **38** | 23 | **100** | 24 | **6** | 25 | **15** |

## PHYSICS

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

## CHEMISTRY

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 51 | **1** | 52 | **4** | 53 | **2** | 54 | **1** | 55 | **4** |
| 56 | **2** | 57 | **1** | 58 | **1** | 59 | **1** | 60 | **1** |
| 61 | **2** | 62 | **1** | 63 | **2** | 64 | **1** | 65 | **3** |
| 66 | **2** | 67 | **1** | 68 | **1** | 69 | **4** | 70 | **1** |
| 71 | **4** | 72 | **10** | 73 | **5** | 74 | **5** | 75 | **2** |

# SOLUTIONS
# MATHEMATICS

1. SOL: Let $b = a + d$.....(i)

$c = a + 2d$.....(ii)

Q $a^2, b^2, c^2$ are in G.P.

$\therefore \left(b^2\right)^2 = a^2c^2$

Or $\pm b^2 = ac$.....(iii)

$\therefore$ $a, b, c$ are in A.P

$\therefore$ $2b = a + c$

Given, $a + b + c = 3/2 \Rightarrow 3b = 3/2 \Rightarrow b = 1/2$

From equations (i) and (ii)

$a = \frac{1}{2} - d,\ c = \frac{1}{2} + d$

$\therefore$ from equation (iii),

$\pm\frac{1}{4} = \left(\frac{1}{2} - d\right)\left(\frac{1}{2} + d\right) \Rightarrow \pm\frac{1}{4} = \frac{1}{4} - d^2$

Taking (-ve) sign,

$\therefore d = \pm\frac{1}{\sqrt{2}}$

$\therefore a = \frac{1}{2} - d = \frac{1}{2} + \frac{1}{\sqrt{2}} \Rightarrow a = \frac{1}{2} + \frac{1}{\sqrt{2}} (Qa > b)$

2. SOL: If $x < -1$, then $x, -(x+1), -(x-1)$ in A.P $\Rightarrow -2x - 2 = x - x + 1 \Rightarrow x = \frac{-3}{2}$

$\therefore$ series $\frac{-3}{2}, \frac{1}{2}, \frac{5}{2}, ..... \Rightarrow S_{20} = 350$

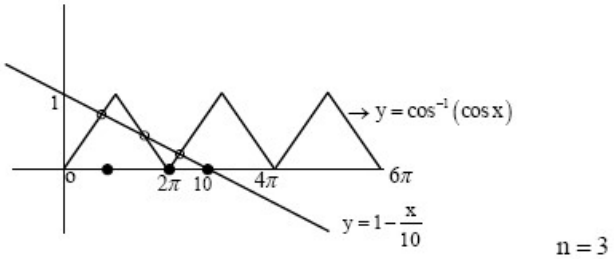
For $-1 \le x \le 1$, then $2(x+1) = x - (x-1)$

$\Rightarrow x = \frac{-1}{2}$

Series is $\frac{-1}{2}, \frac{1}{2}, \frac{3}{2}, ..... \Rightarrow S_{20} = 180$

And For $x > 1$, series does not exist.

3. SOL:




$n = 3$

4. SOL: $f^{1}(0)=\begin{vmatrix}22 & 44 & 66\\ 1 & 1 & 1\\ 1 & 1 & 1\end{vmatrix}+\begin{vmatrix}1 & 1 & 1\\ 33 & 66 & 99\\ 1 & 1 & 1\end{vmatrix}+\begin{vmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 44 & 88 & 144\end{vmatrix}$

$=0$

$\because \text{co}-\text{eff of } x=0$

5. SOL: $f(x)=\begin{cases}x^2-ax+3, & x \text{ is rational}\\ 2-x, & x \text{ is irrational}\end{cases}$

Is continuous when $x^2-ax+3=2-x$ or $x^2-(a-1)x+1=0$, which must have two distinct roots for $(a-1)^2-4>0\Rightarrow(a-1-2)(a-1+2)>0\Rightarrow a\in(-\infty,-1)\cup(3,\infty)$

6. SOL: Equation of circumcircle or $\Delta PAB$ is

$(x-1)(x-3)+(y-8)(y-2)=0\Rightarrow x^2+y^2-4x-10y+19=0$

$x^2+y^2-2x-6y+6+\lambda(x^2+y^2+2x-6y+6)=0$ cuts the circle

$\therefore$ required circle is $x^2+y^2+\frac{5x}{2}-6y+6=0$ $\quad\therefore$ radius $=\frac{\sqrt{73}}{4}$

7. SOL: $|(z-1)+(z+3)|\le|z-1|+|z+3|\le 8$ $\qquad 2|z+1|\le 8$

$\Rightarrow|z+1|\le 4$ $\qquad |(z-4)+5|\le 4$

But $||z-4|-5|\le|(z-4)+5|\le 4$ $\qquad 5-4\le|z-4|\le 5+4$

8. SOL: $\int\frac{-2\sin\left(\frac{27x}{2}\right)\sin\left(\frac{x}{2}\right)}{3-4\sin^2\left(\frac{9x}{2}\right)}dx=\int-2\sin\left(\frac{9x}{2}\right)\sin\left(\frac{x}{2}\right)$

$=\int(\cos 5x-\cos 4x)dx$

$=\frac{\sin 5x}{5}-\frac{\sin 4x}{4}+C$

9. SOL: Put $x+1=\sqrt{3}\tan\theta$ since $\int_0^\infty\frac{\ln x}{(x+1)^2+\left(\sqrt{3}\right)^2}dx$

10. SOL: Put $x+y=z$ and form a linear differential equation in z

11. SOL: If two identical letters are adjacent or have a single letter in between, there is clearly a palindromic substring of length (respectively) two or three. So there cannot be any such substrings.Say we have a permutation of the word REDDER without any palindromic substrings. Let us call the first letter X. The second letter has to be different, let us call it Y. The third letter cannot be X or Y let it be Z. Again, the fourth letter cannot be Y or Z, and only have 3 letters to choose from, so it has to be X. Continuing analogously, the fifth letter has to be Y, and the sixth letter has to be Z. So any word satisfying the problem statement has to be the form XYZXYZ. It is easy to check that such a word indeed does not have any palindromic substrings. X, Y, Z can be any permutation of R, E, D, giving a total of 6 posibilities.

12. SOL: Given, $R=\{(x,y): x,y\in Z, x^2+y^2\le 4\}$

In Roster form,

$R=\{(-2,0),(-1,-1),(-1,1),(-1,0),(0,-2),(0,-1),(0,0),(0,1),(0,2),(1,1),(1,0),(1,-1),(2,0)\}$

Hence, domain of $R=\{-2,-1,0,1,2\}$

13. SOL: Consider $R_1=\{(x,y): x,y\in A \text{ and } y=x+1\}$

$=1833.10-1789.29=43.81$

Since, 4 has no image. So, $R_1$ is not a function.

Now, $R_2=\{(x,y): x,y\in A \text{ and } x+y=5\}$

$=\{(1,4),(2,3),(3,2),(4,1)\}$

Since every element of A has its image in A.

So, $R_2$ is a function in A.

14. SOL: Here, the number of observations is 11 which is odd. Arranging the data into ascending order we have 3, 3, 4, 5, 7, 9, 10, 12, 18, 19, 21.

Now, median $=\left(\frac{11+1}{2}\right)^{th}$ or $6^{th}$ observation $=9$

The absolute values of the respective deviations from the median, i.e., $|x_i-M|$ are 6, 6, 5, 4, 2, 0, 1, 3, 9, 10, 12.

Therefore, $\sum_{i=1}^{11}|x_i-M|=58$

and $MD(M)=\frac{1}{11}\sum_{i=1}^{11}|x_i-M|$

$=\frac{1}{11}\times 58=5.27$

15. SOL: Conceptual

16. SOL: Let the assumed mean $A=65$ Here, $h=10$

We obtain the following table from the given data.

| Class | Frequency $(f_i)$ | Mid value $(x_i)$ | $y_i=\frac{x_i-65}{10}$ | $y_i^2$ | $f_iy_i$ | $f_iy_i^2$ |
|---|---|---|---|---|---|---|
| 30-40 | 3 | 35 | -3 | 9 | -9 | 27 |
| 40-50 | 7 | 45 | -2 | 4 | -14 | 28 |
| 50-60 | 12 | 55 | -1 | 1 | -12 | 12 |
| 60-70 | 15 | 65 | 0 | 0 | 0 | 0 |
| 70-80 | 8 | 75 | 1 | 1 | 8 | 8 |
| 80-90 | 3 | 85 | 2 | 4 | 6 | 12 |
| 90-100 | 2 | 95 | 3 | 9 | 6 | 18 |
| | **N=50** | | | | **-15** | **105** |

Therefore, $\bar{x} = A + \frac{\sum f_i y_i}{50} \times h = 65 - \frac{15}{50} \times 10 = 62$

Variance, $\sigma^2 = \frac{h^2}{N^2}\left[N\Sigma f_i y_i^2 - \left(\Sigma f_i y_i\right)^2\right]$

$= \frac{(10)^2}{(50)^2}\left[50 \times 105 - (-15)^2\right]$

$= \frac{1}{2}[5250 - 225] = 201$

Standard deviation $(\sigma) = \sqrt{201} = 14.18$

17. SOL: First 10 positive integers are 1, 2, 3, 4, 5, 5, 7, 8, 9, and 10 .

Sum of these numbers $\left(\Sigma x_i\right) = 1 + 2 + ..... + 10 = 55$

Sum of squares of these numbers $\left(\Sigma x_i^2\right) = 1^2 + 2^2 + ..... + 10^2 = 385$

Standard deviation $(\sigma) = \sqrt{\frac{\Sigma x_i^2}{n} - \left(\frac{1}{n}\Sigma x_i\right)^2}$

$= \sqrt{\frac{385}{10} - (5.5)^2} = \sqrt{38.5 - 30.25} = \sqrt{8.25}$

$\therefore$ Variance $(\sigma)^2 = 8.25$

18. SOL: Standard deviation $(\sigma) = \sqrt{\frac{\sum_{j=1}^{18}\left(x_j - 8\right)^2}{n} - \left(\frac{\sum_{j=1}^{18}\left(x_j - 8\right)}{n}\right)^2}$

$= \sqrt{\frac{45}{18} - \left(\frac{9}{18}\right)^2}$

$= \sqrt{\frac{45}{18} - \frac{1}{4}} = \sqrt{\frac{81}{36}} = \frac{9}{6} = \frac{3}{2}$

19. SOL: We have, $n = 10,\ \bar{x} = 45,\ \sigma^2 = 16$

Now, mean $(\bar{x}) = \frac{\Sigma x_i}{10} = 45 \Rightarrow \Sigma x_i = 450$

Corrected $\Sigma x_i = 450 - 52 + 25 = 423$

Corrected mean $(\bar{x}) = \frac{423}{10} = 42.3$

Variance $(\sigma)^2 = \frac{\Sigma x_i^2}{n} - \left(\frac{\Sigma x_i}{n}\right)^2$

$\Rightarrow \quad 16 = \frac{\Sigma x_i^2}{10} - (45)^2$

$$\Rightarrow \quad \frac{\Sigma x_i^2}{10} = 2025 + 16$$

$$\Rightarrow \quad \Sigma x_i^2 = 2041 \times 10 = 20410$$

Corrected $\Sigma x_i^2 = 20410 - (52)^2 + (25)^2$

$$= 20410 - 2704 + 625 = 18331$$

Corrected variance $(\sigma)^2 = \frac{18331}{10} - (42.3)^2$

$$= 1833.10 - 1789.29 = 43.81$$

20. Sol: $x, y \neq \frac{\pi}{2}$

Equivalence relation

21. Key: 11

Sol: median $= M = \frac{2k+12}{2} = k+6$ , $7 \le 2k \le 12$

Median $= \frac{\Sigma|x_i - \mu|}{8} = 6$

$\Rightarrow (k+3)+(k+1)+(k-1)+(6-k)+(6-k)+(10-k)+(15-k)+(18-k) = 48$

$\Rightarrow \quad k = 5$

$\therefore$ Median $= 5 + 6 = 11$

22. Key: 38

Sol: $\sum_{i=1}^{5} a_i = 25$ , $\sum_{i=1}^{5} b_i = 40$

$$\sigma_A^2 = \frac{\Sigma a_i^2}{5} - \left(\frac{\Sigma a_i}{5}\right)^2 = 12$$

$$\Rightarrow \quad \Sigma a_i^2 = 185$$

$$\sigma_B^2 = \frac{\Sigma b_i^2}{5} - \left(\frac{\Sigma b_i}{5}\right)^2 = 20$$

$$\Rightarrow \quad \Sigma b_i^2 = 420$$

$C = \{a_1 - 3, a_2 - 3, ....., a_5 - 3, b_1 + 2, b_2 + 2, .....b_5 + 2\}$

Mean of set $C = \bar{C} = \frac{\Sigma a_i - 15 + \Sigma b_i + 10}{10} = 6$

$$\sigma_C^2 = \frac{\sum_{j=1}^{10} C_j^2}{10} - (\bar{C})^2 = \frac{\Sigma(a_i - 3)^2 + \Sigma(b_i + 2)^2}{10} - 36$$

$$= \frac{\Sigma a_i^2 + \Sigma b_i^2 - 6\Sigma a_i + 4\Sigma b_i + 65}{10} - 3$$

$$= 32$$

Mean + variance of set C = 38

23. Key: 100

Sol: $\Sigma(x_i-2)=30$ $\Sigma(x_i-\beta)^2=98$

$\Rightarrow \Sigma x_i=50$ $\frac{\Sigma(x_i-\beta)^2}{10}-\left(\frac{\Sigma(x_i-\beta)}{10}\right)^2=\frac{4}{5}$

$= \frac{98}{10}-\left(\frac{50-10\beta}{10}\right)^2=\frac{4}{5}$

$(5-\beta)^2=\frac{98}{10}-\frac{8}{10}=9$

$5-\beta=\pm3 \Rightarrow \beta=8>2$

New observations $2(x_i-1)+4\beta=2x_i-2+32=2x_i+30$

$i=1,2,3,.....10$

New mean $=\frac{2\Sigma x_i+10\times30}{10}=40$

New variance $=2^2(\sigma^2)=4\left(\frac{4}{5}\right)=\frac{16}{5}$

$\frac{\beta M}{\sigma^2}=\frac{8\times40}{16/5}=5\times20=100$

24. Key: 6

Sol: For reflexive $(1,1),(2,2),(3,3)\in R$

R is not symmetric $(2,1)\notin R$

$R_1=\{(1,1),(2,2),(3,3),(1,2)\}$

$R_2=\{(1,1),(2,2),(3,3),(1,2),(1,3)\}$

$R_3=\{(1,1),(2,2),(3,3),(1,2),(3,2)\}$

$R_4=\{(1,1),(2,2),(3,3),(1,2),(1,3),(3,1)\}$

$R_5=\{(1,1),(2,2),(3,3),(1,2),(3,2),(2,3)\}$

$R_6=\{(1,1),(2,2),(3,3),(1,2),(3,1),(3,2)\}$

25. Key: 15

1

1 2

2 3 5

5 7 10 15

Bell triangle

# PHYSICS

26. $\vec{v} = \alpha\hat{i} + \beta t\hat{j}$

$\vec{v} = \alpha\hat{i} + \beta t\hat{j}$

$\vec{a} = \beta\hat{j}$

Speed $v = \sqrt{\alpha^2 + \beta^2 t^2}$

Tangential acceleration $a_t = \dfrac{dv}{dt}$

$a_t = \dfrac{d}{dt}\left(\sqrt{\alpha^2 + \beta^2 t^2}\right)$

$At\ t = \dfrac{\alpha\sqrt{3}}{\beta}, a_{t=} \dfrac{\sqrt{3}\beta}{2}$

Normal acceleration; $a_n = \sqrt{a^2 - a_t^2}$

$\therefore a_n = \dfrac{\beta}{2}$

27. Net mass $M = \left[\dfrac{4}{3}\pi\left\{(2R)^3 - R^3\right\}\right]\rho$

$\rho = $ density

$\therefore\ \rho = \dfrac{3M}{28\pi R^3}$

Now; $V = V_{2R_{at\ centre}} - V_{R_{at\ centre}}$

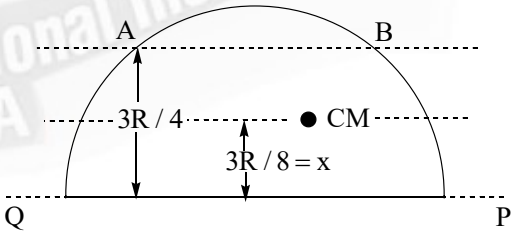
$V_{2R} = -\dfrac{GM_1}{2R}$; Where $M_1 = \dfrac{8}{7}M =$ $\quad V_R = -\dfrac{GM_2}{2R}$; Where $M_2 = \dfrac{M}{7}$

$\therefore V = -\dfrac{G}{2R}\left(\dfrac{8M}{7}\right) - \left(-\dfrac{G}{2R}\left(\dfrac{M}{7}\right)\right) \Rightarrow V = -\dfrac{9GM}{14R}$

28. $I_{PQ} = I_{CM} + Mx^2$

$I_{AB} = I_{CM} + Mx^2$

$\therefore\ I_{AB} = I_{PQ}$




$\Rightarrow\ I_{AB} = \dfrac{2}{5}MR^2 = MK^2$

$\therefore\ K = \sqrt{\dfrac{2}{5}}R$

29. $\frac{hc}{\lambda}-\phi=e(5V_0)$ ....(1)

$\frac{hc}{3\lambda}-\phi=e(V_0)$ ....(2)

Solving (1) & (2), we get

$\phi=\frac{hc}{6\lambda}$

30. Conceptual

31. From $\rho=x$

Also, $\mu=\rho A=xA$

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

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

$\Rightarrow \int_0^L \sqrt{x}\,dx=\sqrt{\frac{T}{A}}\int_0^t dt$

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

32. $\frac{Q_{in}}{W}=\frac{1}{\frac{T_2}{T_1}-1}=\frac{T_1}{T_2-T_1}=\frac{270}{30}=9$

$W=\frac{1260}{9}KJ/\min=2.33\ kJ/\sec$

33. Conceptual

34. Conceptual

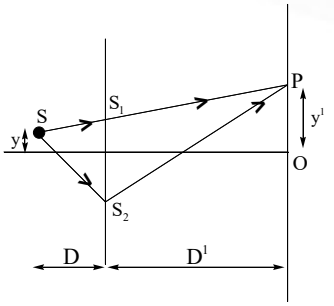
35. Conceptual

36. Surface energy $U=2(4\pi r^2)\sigma$

Power Required is $P=\frac{dU}{dt}=16\pi r\sigma\alpha$

37. $y'=\frac{d}{2}$ for a point exactly in front $S_1$ So, $\Delta x=\frac{yd}{D}+\frac{\frac{d}{2}d}{D'}$

For maximum intensity $\Delta x=n\lambda$



$$\frac{yd}{D}+\frac{\frac{d^2}{2}}{D'}=n\lambda$$

$$\Rightarrow 0.5\sin\pi t+\frac{(1)}{4}=n\times 500\times 10^{-6}\times 10^{3}$$

$$\Rightarrow 0.5\sin\pi t+0.25=0.5n$$

$$\sin(\pi t)=\frac{0.5n-0.25}{0.5}$$

For minimum 't' we have $n=1$

$$\sin(\pi t)=\frac{0.5-0.25}{0.5}=0.5$$

$$\pi t=\frac{\pi}{6}$$

$$t=\frac{1}{6}s$$

38. Conceptual

39. Conceptual

40. At a specific reverse voltage in *p-n* junction a huge current flows in reverse direction known as avalanche current.

41. The electrical conductivity of Ge,

$$\sigma=\frac{1}{\rho}=e(\mu_e n_e+\mu_h n_n)$$

$$=\left(1.6\times 10^{-19}\right)[0.36+0.17]\left(2.5\times 10^{19}\right)$$

$$=2.12\ S/m$$

42. Consider the fig. (b) given here, suppose the potential difference between A and B $r_1=5k\Omega$ and $r_2=5k\Omega$ are resistance in series connection.

$$\Rightarrow\ V=2+0.3=2.3V$$

43. For upper part

Here, $C=\overline{\overline{A}\cdot\overline{B}}=\overline{\overline{A}+\overline{B}}$

$=A+B$ (From De-Morgan's Theorem)

Here, output C is equivalent to OR gate.

Foe lower part

44. As *p-n* junction conducts during positive half cycle only, the diode connected here will work is positive half cycle. Potential difference across $C$ = peak voltage of the given AC voltage = $V_0 = V_{rms}\sqrt{2} = 220\sqrt{2}v$.

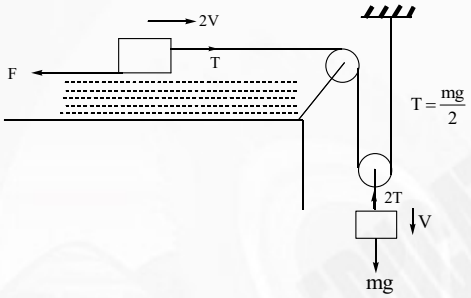
45. Here, $C = A.B \ \ and \ \ D = \overline{A}.B$

$$E = C + D = (A.B) + (\overline{A}.B)$$

Explanation The truth table of this arrangement of gates can be given by

| A | B | $\overline{A}$ | $C = A.B$ | $d = \overline{A}.B$ | $E = (C + D)$ |
|---|---|---|---|---|---|
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 1 | 1 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 1 | 0 | 1 |

46. For Block




$$\frac{mg}{2} = \eta A\frac{2V}{d}$$

$$\Rightarrow \eta = \frac{mgd}{4AV} = 5\times10^{-3}P_a - sec$$

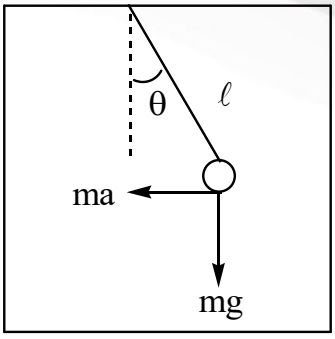
47. $a = \dfrac{t\sin\theta}{2m}$ ...(i)

$T\cos\theta = mg$ ...(ii)

Restoring torque

$$\tau = -\left(mg\ell\sin\theta + \frac{mg}{2}\ell\sin\theta\right)$$

$$\longrightarrow a = \frac{T\sin\theta}{2m}$$



$$\Rightarrow m\ell^2\alpha = -\frac{3mg\ell}{2}\theta \Rightarrow \alpha = -\left(\frac{3g}{2\ell}\right)\theta \quad \therefore \omega = \sqrt{\frac{3g}{2\ell}}$$

$$T = 2\pi\sqrt{\frac{2\ell}{3g}}$$

$$\therefore K = \frac{2}{3} \Rightarrow 3K = 2$$

48. $-1.51\text{eV} = \dfrac{-13.6\text{eV}}{n^2}$

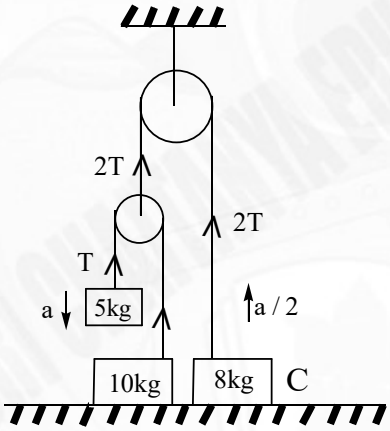
$$n^2 = \frac{13.6}{1.51} = 9$$

$$\therefore L = \frac{nh}{2\pi} = \frac{9h}{2\pi}$$ 49. $5g - T = 5a$.....(1)

$$\Rightarrow x = 3$$

$2T - 8g = 8\dfrac{a}{2}$.....(2)

Solving (1) & (2)




$$\frac{a}{2} = 0.7\ \text{m/s}^2$$

50. For P: $\dfrac{1}{-x} - \dfrac{1}{-30} = \dfrac{1}{f}$ ...(1)

For Q: $\dfrac{1}{x} - \dfrac{1}{-60} = \dfrac{1}{f}$ ...(2)

(2) + (1) gives

$$\frac{1}{60} + \frac{1}{30} = \frac{2}{f}$$

$f = 40$ cm

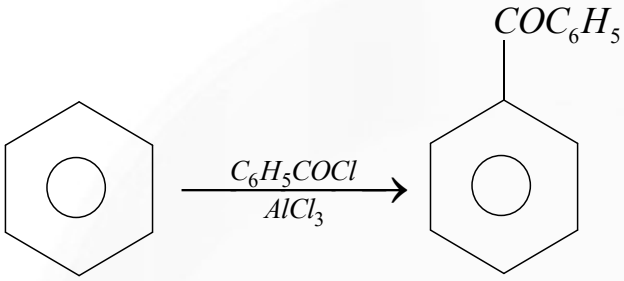
# CHEMISTRY

51. Covalency of Mn is 7 in $Mn_2O_7$ and 4 in $MnF_4$

52. Field strength of ligands $CN^- > NH_3 > H_2O$

53. $CS_2$ is non-polar solvent cannot polarize
Phenol with (bromine + water) can give 2,4,6-Tribromophenol

54.



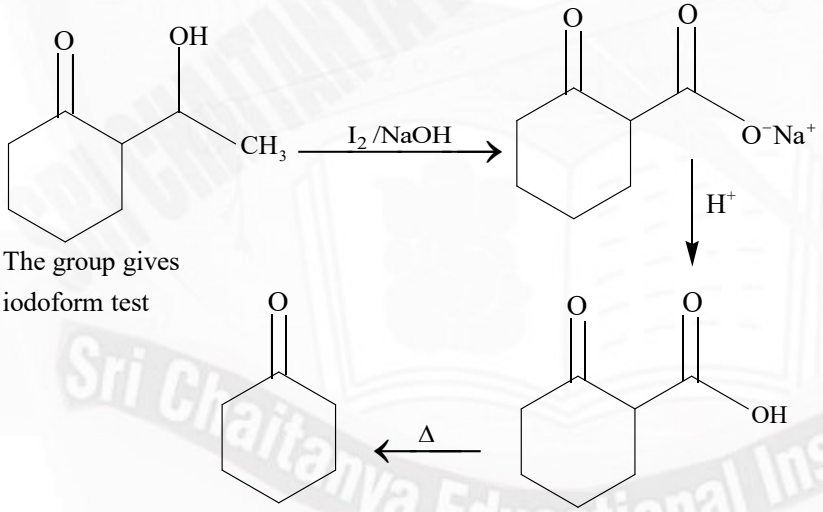

55. B.P of n-pentane > 2 - methyl butane > 2, 2 – dimethyl propane > n-butane

56. $E_n = \frac{E_1}{n^2} \times Z^2$

57. Minerals of Boron

58. sucrose on esterification form Octa acetate

59.

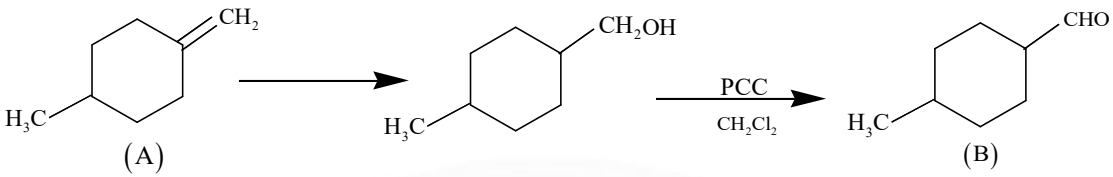



60. On cis-alkene there is syn addition of two-OH groups forming meso compound.

61. MOT

62. Nitrogen doesn't have d-orbitals in its valence shell.
63. Mesomeric Effect > Hyperconjugation > Inductive Effect
64. Hydrolysis of Halides of group-14

65.




(A) (B)

66.

$$NaCl_{(s)} + K_2Cr_2O_{7(s)} + H_2SO_4\,(\text{few drops}) \xrightarrow[reaction]{Non-redox} CrO_2Cl_2\,(orange\ red\ vapours)\uparrow + HO$$

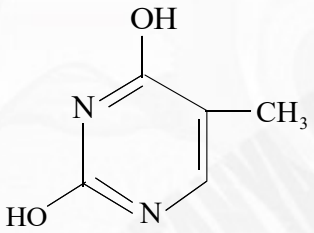
$$CrO_2Cl_2 + OH^-_{(eq)} \rightarrow CrO^{2-}_{4(aq.)}\,(yellow\ sol.) + Cl^- + 2H_2O$$

67. On the basics of structure of guanine and complementary bases present in them, we can say that if the sequence of bases in one strand of DNA is I, then the sequence in the second strand should be II

A : T : G : C : T : T : G : A : I

T : A : C : G : A : A : C : T : II

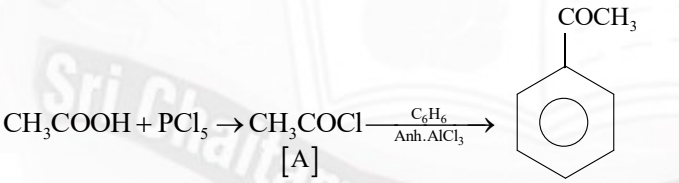
68. The correct structure of thymine is



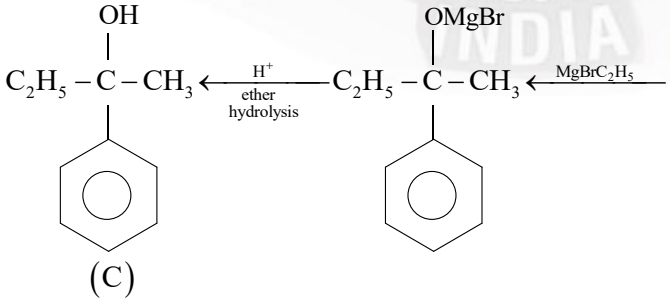

Thymine ( T )

69. $I_2$ and $Na_2CO_3$ react with acetophenone $(C_6H_5COCH_3)$ to give yellow ppt. of $CHI_3$ but benzophenone $(C_6H_5COC_6H_5)$ does not and hence can be used to distinguish between them.

70.




Friedel Craft reaction




(C)

71. $\log\frac{k_2}{k_1}=\frac{E}{2.303}\left[\frac{T_2-T_1}{T_1T_2}\right]$

$\log 2=\frac{E}{2.303}\left[\frac{10}{290\times 300}\right]$

$\therefore E=12062cal\approx 12kcal$

72.

$$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow 10CO_2 + 2Mn^{2+} + 8H_2O$$
$$+7 \qquad +6 \qquad\qquad +8 \qquad\qquad +2$$

$2MnO_4^- \equiv 5C_2O_4^{2-}$

$\frac{M_1V_1}{2}=\frac{M_2V_2}{5}$

$\frac{0.2\times V_1}{2}=\frac{0.1\times 50}{5}$

$V_1=10mL$

73. $\Delta T_f=i\times k_f\times m$

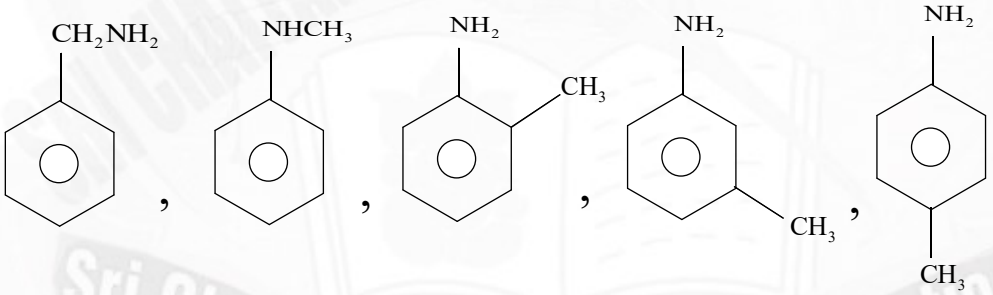
$0.558=i\times 1.86\times 0.1$

$i=3,\ \alpha=1$

$\alpha=\frac{i-1}{n-1}, n=3$

$\left[Co(NH_3)_5Cl\right]Cl_2 \quad = \quad x=5$

74.




75. +I groups decrease the reactivity of a diazonium cation towards coupling.

2,6