SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC
TIME: 3 hrs.

DPP-25

DATE: 12-05-2020

KEY SHEET
MATHEMATICS-IIA

1) **3**	2) **4**	3) **3**	4) **4**	5) **2**	6) **2**	7) **2**	8) **3**	9) **2**	10) **2**
11) **1**	12) **2**	13) **2**	14) **2**	15) **2**	16) **3**	17) **4**	18) **4**	19) **2**	20) **3**

MATHEMATICS-IIB

21) **4**	22) **1**	23) **3**	24) **2**	25) **1**	26) **2**	27) **2**	28) **2**	29) **3**	30) **3**
31) **4**	32) **2**	33) **3**	34) **2**	35) **1**	36) **1**	37) **4**	38) **1**	39) **2**	40) **3**

PHYSICS

41) **2**	42) **2**	43) **4**	44) **3**	45) **3**	46) **1**	47) **3**	48) **3**	49) **2**	50) **4**
51) **2**	52) **3**	53) **1**	54) **4**	55) **1**	56) **1**	57) **2**	58) **3**	59) **1**	60) **1**

CHEMISTRY

61) **1**	62) **4**	63) **4**	64) **3**	65) **3**	66) **4**	67) **3**	68) **4**	69) **1**	70) **3**
71) **3**	72) **2**	73) **3**	74) **2**	75) **3**	76) **1**	77) **4**	78) **1**	79) **3**	80) **3**

HINTS & SOLUTIONS
MATHEMATICS-IIA

1. 1 unit squares = 8^2
   2 unit squares = 7^2
   3unit squares = 6^2

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   8 unit squares = 1^2
   $\therefore$ Total number of squares that can be formed on a chess board
   $= 8^2 + 7^2 + 6^2 + - - - - - + 1^2$
   $= \frac{8(8+1)(16+1)}{6} = 204$
2. No of triangles which can be formed using the vertices of a regular polygon of 'n' sides = $T_n = n_{c_3}$

   But
   $T_n - T_{n-1} = 55$
   $n_{c_3} - n - 1_{c_3} = 55$
   $\therefore n = 12$
3. No of non-bijections
   = (No of functions)-(No of bijections)
   $= 5^5 - 51$
   $= 3125 - 120 = 3005$
4. Vowels (A, E, I, O, U) five, consonants (Q, T, N) three
   i) 3 vowels can be chosen in 5_{c_3} ways
   ii) 2 consonants can be chosen in 3_{c_2} ways
   iii) 2 consonants can be bundled in 2!ways
   iv) 3 vowels+(2consonants bundle)can be arranged in 4! ways
   Required number of words = $5_{c_3} 3_{c_2} 2!4!$
5. $\sum_{r=1}^{10} r.r_{p_r} = \sum_{r=1}^{10} r.r! = \sum_{r=1}^{10} (r+1-1)r!$
   $= \sum_{r=1}^{10} \left[(r+1)! - r! \right]$
   $= 11! - 1!$
6. $(p+1)(q+1)(r+1) - 1$
7. H,X,G,N $\rightarrow$ 4 odd
   E,A,O $\rightarrow$ 3 even places
   In 4 odd places 4 consonants can be filled in 4! Ways, 3 vowels can be filled in 3! ways
   Required number of ways = 4!3!
8. Required $Sum = 4!(1+3+5+7+9)(11111)$
   = 19980
9. Required number of ways $= 7c_3 \times 4c_2 + 7c_2 \times 4c_3 + 7c_1 \times 4c_4$
10. $30c_2 - 8c_2 + 1$
11. Required arrangements
    $= = 5! \left[\frac{1}{2!} - \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!} \right] = 44$

12. Principal diagonal elements are arranged in 4_{p_3} ways and remaining 6 places is filled in 4 ways each $\Rightarrow 4_{p_3} \times 4^6 = 4^7.6$

13. $3\times3\times3$

14. $3^{p+m+n}.2^m.7^n$

Odd proper divisors $\rightarrow (p+m+n+1)(n+1)-1$

15. $5c_3.8c_7 + 5c_4.8c_6 + 5c_5.8c_5$

16. Put x = a-1, y = b-1, z = c-1, w = d-1

Then a,b,c ≥ 0 and

$(a-1)+(b-1)+(c-1)+(d-1)=20$

$\Rightarrow a+b+c+d=24$

The number of nonnegative integral solutions of this equations is

$^{24+4-1}c_{4-1} = 27_{c_3}$

17. $\sum_{i=1}^{20}\left(\frac{\left(^{20}c_{i-1}\right)}{^{20}c_i + {}^{20}c_{i-1}}\right)^3$

Now $\frac{^{20}c_{i-1}}{^{20}c_i + {}^{20}c_{i-1}} = \frac{^{20}c_{i-1}}{^{21}c_{i-1}} = \frac{i}{21}$

Let given sum be S, so

$S = \sum_{i=1}^{20}\frac{(i)^3}{(21)^3} = \frac{1}{(21)^3}\left(\frac{20\times21}{2}\right)^2 = \frac{100}{21}$

Given $S = \frac{k}{21} \Rightarrow k = 100$

18. Given word MISSISSIPPI

$\Rightarrow$M I I I I P P

Can be arranged in $\frac{7!}{2!4!}$ and in 8 gaps.

4S's can be arranged in $^8c_2$ ways

19. Option verification ELNADGI

20. $4_{p_3}(1111)(2+3+4+5+6) = 533280$

MATHEMATICS-IIB

21. $\int\frac{1+\cos^2 x}{2\cos^2 x}dx = \frac{1}{2}\int\sec^2 x dx + \frac{1}{2}\int dx$

$\frac{1}{2}Tan\,x + \frac{1}{2}x + c$

22. $\int\frac{(\cos x)^{n-1}}{(\sin x)^{n-1}}\times\frac{1}{\sin^2 x}dx = -\int\cot^{n-1}x\left(-\cos c^2 x\right)dx$

$= -\frac{\cot^n x}{n} + c$

23. $\frac{1}{2}\int\frac{2\frac{1}{\cos^2 x}}{(2Tan\,x+3)^2}dx \Rightarrow 2Tan\,x+3=t$

$2\sec^2 x dx = dt$

$$=\frac{1}{2}\int\frac{1}{t^2}dt$$

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

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

25. $\int\frac{1}{(x-7)(x-6)}dx=\int\left(\frac{1}{x-7}-\frac{1}{x-6}\right)dx=\log\left|\frac{x-7}{x-6}\right|+c$

$a+b=7+6=13$

26. $\log x=t\Rightarrow x=e^t$

$dx=e^t dx$

$\therefore\int e^t\left[\frac{1}{t}-\frac{1}{t^2}\right]dt=e^t.\frac{1}{t}+c=x.\frac{1}{\log x}+c=\frac{x}{\log x}+c$

27. $u=x\qquad v=\cos ec\,x.\cot x$

Use Integration by parts

28. Use the formula $\int e^{ax}\cos bx\,dx=\frac{e^{ax}}{a^2+b^2}\left(a\cos bx+b\sin bx\right)+c$

29. $\int Tan\left(x-\frac{x}{2}\right)dx=\int Tan\frac{x}{2}dx$

$=2\log\left|\sec\frac{x}{2}\right|+c$

30. $\sin^2\alpha-\sin^2 x=\left(1-\cos^2\alpha\right)-\left(1-\cos^2 x\right)$

$=\cos^2 x-\cos^2\alpha$

$\int\frac{\cos^2 x-\cos^2\alpha}{\cos x-\cos\alpha}dx=\int\left(\cos x+\cos\alpha\right)dx=\sin x+x\cos\alpha+c$

31. $-\sqrt{2}\int\cos\left(2x+\frac{\pi}{4}\right)dx=-\frac{1}{\sqrt{2}}\sin\left(2x+\frac{\pi}{4}\right)+k$

$=\frac{1}{\sqrt{2}}\sin\left(\pi+2x+\frac{\pi}{4}\right)+k$

$=\frac{1}{\sqrt{2}}\sin\left(2x+\frac{5\pi}{4}\right)+k$

$\therefore a=\frac{-5\pi}{4}\ and\ \ b\in R$

32. $\int\frac{x\left(\frac{1}{x^2}-1\right)^{\frac{1}{3}}}{x^4}dx\quad put\,\frac{1}{x^2}-1=t$ 33.

33. Differentiating on both sides

34. Use by Parts formula

35. $\int\frac{x^7+x-x}{x\left(x+x^7\right)}dx=\int\frac{1}{x}dx-\int\frac{dx}{x+x^7}$

$=\log|x|-p\left(x\right)+c$

36. $\int \frac{3^x}{\sqrt{\left(3^x\right)^2-1}}dx \quad 3^x=t$

$3^x \log 3 dx = dt$

$= \frac{1}{\log 3}\int \frac{dt}{\sqrt{t^2-1}} = \frac{1}{\log 3}\cosh^{-1}(t)+c$

$= \frac{1}{\log 3}\log\left|3^x+\sqrt{9^x-1}\right|+c$

37. $\sin^8 x-\cos^8 x = \left(\sin^4 x\right)^2-\left(\cos^4 x\right)^2$

$= \left(\sin^4 x+\cos^4 x\right)\left(\sin^4 x-\cos^4 x\right)$

$= \left(1-\sin^2 x\cos^2 x\right)\left(-\cos 2x\right)$

$\int \frac{\left(1-2\sin^2 x\cos^2 x\right)\left(-\cos 2x\right)}{1-2\sin^2 x\cos^2 x}dx = -\int cos2x\,dx = -\frac{1}{2}\sin 2x+c$

38. Divide both Nr and Dr by $\cos^2 x$

$\int \frac{\sec^2 x}{a^2 Tan^2 x+b^2}dx \quad aTan\,x=t$

$a\sec^2 x\,dx = dt$

$= \int \frac{1}{t^2-b^2}\frac{1}{a}dt = \frac{1}{a}.\frac{1}{b}.Tan^{-1}\left(\frac{1}{b}\right)+c = \frac{1}{ab}Tan^{-1}\left(\frac{a}{b}Tan\,x\right)+c$

39. $f(x) = x\left|\cos x\right| \frac{\pi}{2}<x<\pi$

$f(x) = -x\cos x\left[\therefore \cos x<0 \text{ for } x\in\left(\frac{\pi}{2},\pi\right)\right]$

$\int f(x)dx = -\int x\cos x+c$

$= -x\sin x-\cos x+c$

40. $Put\ x+99=t^2$

PHYSICS

41. Form factor $= \frac{rms\,vlaue}{avg\,value\,over\,half\,cycle}$

$\frac{I_0}{\sqrt{2}}\times\frac{\pi}{2I_0} = \frac{\pi}{2\sqrt{2}}$

42. $t=\frac{T}{4}, T=\frac{2\pi}{\omega}=\frac{2\pi}{2\pi t}$

43. For Half cycle

$E_{rms} = \int_0^{\frac{T}{2}} E_0 \sin\cot dt$

$= \frac{2E_0}{\pi}$

44. $X_L = WL = 2\pi fl$

$I_{rms} = \frac{V_{rms}}{X_L}$

$I_0 = \sqrt{2}, I_{rms}$

45. $i_{rms} = \frac{V_{rms}}{X_c}$

46. Power factor of AC circuit is given by $\cos\phi = \frac{R}{Z}$

47. $U_E + U_B = U_{\max} = U_{B_{\max}} + \frac{2q^2}{2c} = \frac{Q^2}{2c} \Rightarrow q = \frac{Q}{\sqrt{2}}$

48. We know that $n = \frac{1}{2\pi\sqrt{LC}}$

49. $\frac{NS}{Np} = \frac{VS}{Vp}$

50. $V_1 = iX_L = iwc \Rightarrow V = \sqrt{V_R^2 + V_L^2}$

51. Power factor $\cos\phi = \frac{R}{Z}$

52. $V = 200\sqrt{2}\sin\left(wt + \frac{\pi}{2}\right)$

$V_{rms} = \frac{V_0}{\sqrt{2}}$

53. $P_{V_p} = 300, N_S = 150, P_0 \Rightarrow 2200W$

$P_0 = V_0 I_0 \Rightarrow 2200 = V_0 \times 10 \Rightarrow V_0 = 220V$

$\therefore \frac{V_i}{V_0} = \frac{N_p}{N_s} \Rightarrow V_i = 2 \times 220 = 440V$

Also $P_0 = V_i I_p$

$I_p = \frac{2200}{400} = 5A$

54. $Q = \frac{X_L}{R} = \frac{LW_0}{R}$

55. $P = i_{rms} \times v_{rmss} \times \cos\phi$

$= \frac{100}{\sqrt{2}} \times \frac{20}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = \frac{1000}{\sqrt{2}}$

Wattles Current $= i_{rms}\sin\phi$

$= \frac{20}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = 10A$

56. Here phase difference=98

$E_0 = \sqrt{8^2 + 6^2} = 10$

$E_{rms} = \frac{E_0}{\sqrt{2}} = \frac{10}{\sqrt{2}} = 5\sqrt{2}\,volts$

57. $dc, i = 4A, V = 12V$

$ac, V = 12V, t = \frac{25}{\pi} Hz$

$Z = \sqrt{R^2 + X_L^{\ 2}}$

$I = \frac{E}{Z} \Rightarrow Z = 5$

58. $P_{rms} = \frac{V_{rms}}{Z} = \frac{V_{rms}}{\sqrt{R^2 + W^2L^2}}$

$= \frac{180}{\sqrt{100^2 + 4000}}$

$= \frac{18}{\sqrt{140}}$

$= 1.522A$

59. $E = 200\sin 100\pi t$

$C = 10^{-6}F, R = 100\Omega$

$W = \frac{1}{\sqrt{LC}} \Rightarrow L = \frac{1}{W^2C}$

60. $Power = v_{rms}\, i_{rms} \cos\phi$

$= \frac{v_0 i_0}{2}\cos\phi$

$= \frac{50 \times 50}{2}\cos\left(\frac{\pi}{3}\right)mW$

$= \frac{2.5}{4}W$

$= 0.625W$

CHEMISTRY

61. Buna-N
Co-polymerization of 1,3 butadiene and acrylonitrile gives Buna -N
62. Conceptual
63. Conceptual
64. $\overline{M}n = \frac{n_1M_1 + n_2M_2}{n_1 + n_2}$

$n_1 = 2 \qquad M_1 = 20,000$

$n_2 = 2 \qquad M_2 = 50,000$

65. The monomers glycine and amino caproic acid is Nylon-2-Nylon-6
66. Conceptual
67. Conceptual
68. $\overline{M_n} = \frac{weight\,of\,the\,polymer}{Total\,No\,of\,molecules} = \frac{\sum niMi}{\sum ni}$

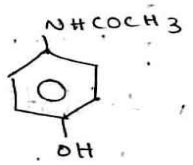
$= \frac{8000 \times 15 + 15 \times 8000}{15 + 15} = 44000$

69. $PDI = \frac{\overline{M_w}}{\overline{M_n}} = \overline{M_w} = \frac{N_1M_1^2 + N_2M_2^2}{N_1M_1 + N_2M_2}$

$\overline{M_n} = \frac{M_1N_1 + M_1N_2}{N_1 + N_2}$

70. Thermoplastic polymer (x) — thermosetting polymers(y)
Examples — Examples
Polyethylene — Bakelite, melamine
Poly styrene
71. Antipyretics lower the body
Temperature in high fever
72. Chloramphenicol is an example for broad spectrum antibiotic.

73. On the basis of molecular targets
74. The structure of paracetamol is



75. Analgin is derivative of pyrazole
76. KBr is good sedative but not Hypnotic
77. Alitame is about 2000 times sweeter than that canesugar
78. Ofloxacin is not analgesic, it is broad spectrum antibiotic
79. Structure of Ranitidine

80. Conceptual

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