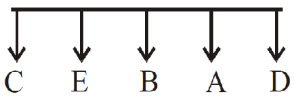
CLASS-XI

TEST DATE : 30 - 12 - 2021

HINT – SHEET

SECTION-A : MENTAL ABILITY

1. (4)



2. (1)

$(4)^2 + 3 = 19$

Similarly, $(7)^2 + 3 = 52$

3. (4)

$$\frac{\text{Total no. of alphabets } (26)}{\text{Position value of alphabet}} = \text{Remainder}$$

$$\frac{26}{\text{G}(7)} = \text{Remainder is 5}$$

4. (3)

FEED : F-6; E-5; E-5; D-4

$\Rightarrow 6 \times 1 + 5 \times 2 + 5 \times 3 + 4 \times 4 = 47$

TREE : T-20; R-18; E-5; E-5

$\Rightarrow 20 \times 1 + 18 \times 2 + 5 \times 3 + 5 \times 4 = 91$

MEET : M-13; E-5; E-5; T-20

$\Rightarrow 13 \times 1 + 5 \times 2 + 5 \times 3 + 20 \times 4 =$ **118**

5. (1)

Sum of age of 6 members = $22 \times 6 = 132$

Sum of age of 5 members excluding younger one = $132 - 7 = 125$

average age of 5 member = $\frac{125}{5} = 25$

average age at the time of birth = $25 - 7 = 18$

6. (3)

Person	B	D	A	F	G	C	H	E
Room	2	4	3	6	1	5	8	7

7. (3)

8. (2)

9. (1)

10. (4)

11. (2)

$1^3 + 1 = 2$

$\Rightarrow 2^3 + 2 = 10$

$\Rightarrow 3^3 + 3 = 30$

$\Rightarrow 4^3 + 4 = 68$

$\Rightarrow 5^3 + 5 = 130$

12. (2)

$20 \div 5 \times 4 - 6 + 5$

$= 4 \times 4 - 6 + 5$

$= 16 - 6 + 5$

$= 10 + 5$

$= 15$

13. (1)

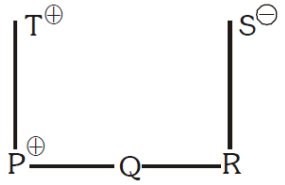
$CE \rightarrow 35$

$\Rightarrow 35 \times 2 = 70$

$DE \rightarrow 45$

$\Rightarrow 45 \times 2 = 90$

14. (4)



15. (3)

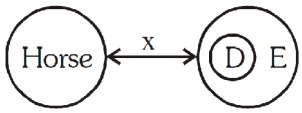
$\left.\begin{array}{l} 2-1=1 \\ 6-3=3 \\ 5-4=1 \end{array}\right] \longrightarrow 131$

$\left.\begin{array}{l} 7-5=2 \\ 9-3=6 \\ 3-1=2 \end{array}\right] \longrightarrow 262$

16. (1)

17. (3)

18. (2)



19. (2)

20. (1)

21. (4)

22. (2)

By observation

23. (1)

By observation

24. (2)

1st and last day of simple year is same therefore in leap year one day is extra Saturday.

25. (4)

By observation

26. (3)

By observation

27. (2)

QUESTION → EINOQSTU
↓
FJOPRTUV

28. (4)

26

$\Rightarrow (5 \times 3) - (2 \times 1) = 13$

$\Rightarrow (8 \times 7) - (6 \times 5) = 26$

29. (2)

Thursday [by counting number of odd days]

30. (2)

48 {by observation}

SECTION-B : PHYSICS

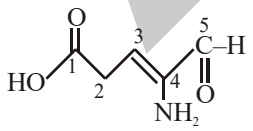
31. (1)
32. (3)
33. (1)
34. (1)
35. (3)
36. (1)
37. (3)
38. (3)
39. (3)
40. (3)
41. (1)
42. (4)
43. (4)
44. (3)
45. (1)
46. (1)
47. (3)
48. (2)
49. (1)
50. (4)
51. (4)
52. (3)
53. (2)
54. (3)
55. (3)
56. (1)
57. (1)
58. (3)
59. (1)
60. (3)

SECTION-C : CHEMISTRY

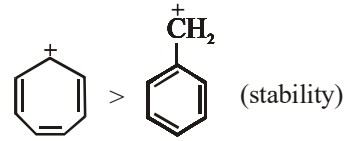
61. (3)
62. (2)
63. (4)

$$\text{Ionic radii} - \propto \frac{-\text{ve charge}}{+\text{ve charge}}$$

64. (1)
65. (2)



66. (2)


(stability)

Tropylium Benzyl

67. (2)

68. (2)

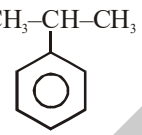
69. (3)

Acidic strength $\propto$ –M, –I

70. (1)

71. (2)

$$CH_3–CH_2–CH_2–Cl \xrightarrow{AlCl_3} CH_3–CH_2–\overset{+}{C}H_2$$

$$\xrightarrow{H^- \text{shift}} CH_3–\overset{+}{C}H–CH_3 \longrightarrow$$ 

72. (2)

73. (2)

1.4gm nitrogen = 0.1 mole N atom

$= 6.02 \times 10^{22}$ N atoms

74. (2)

Position isomer has different position of substituents.

75. (3)

In isothermal Expansion $\Delta H = 0$

$\Delta G = -T\Delta S$

76. (2)

77. (1)

78. (2)

79. (2)

80. (4)

81. (1)

82. (1)

83. (3)

84. (2)

2° amine is most basic.

85. (1)

$PbBr_2 \rightleftharpoons Pb^{+2}(aq) + 2Br^-(aq)$

$0.8S \quad 2 \times 0.8S$

$8 \times 10^{-5} = K_{sp} = (0.8\ S)\ (1.6S)^2$

$S = \left(\frac{10^{-4}}{1.6 \times 1.6}\right)^{1/3}$

86. (1)

–M group decrease stability of carbocation.

87. (3)

88. (3)

Velocity is proportional to $\frac{Z}{n}$

89. (2)

90. (2)

SECTION-D : MATHEMATICS

91. Ans. (1)

Sol. Put y = x

$ax^2 + 6x^2 + bx^2 = 0$

$a + b = -6$

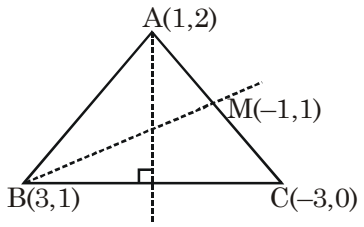
again put y = –x

$ax^2 - 6x^2 + bx^2 = 0$

$a + b = 6$

92. Ans. (4)

Sol.



Equation of altitude through A : $y + 6x = 8$

Equation of median through B : $y - 1 = 0$

93. Ans. (2)

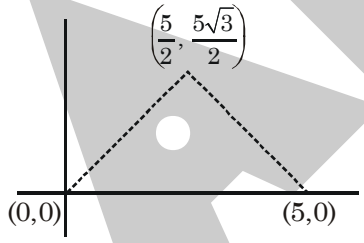
Sol. Area = $\frac{p^2}{\sqrt{3}}$

Where p is perpendicular distance of point (2, 3) from line $x + y - 2 = 0$

$p = \frac{3}{\sqrt{2}}$

94. Ans. (3)

Sol.



given triangle is equilateral so centroid and orthocentre are same point

95. Ans. (1)

Sol. $\log_{10}\left(\frac{\sin x + \cos x}{\sqrt{2}}\right) = \frac{1}{2}\log_{10}\left(\frac{6}{10}\right)$

$\sin x + \cos x = \sqrt{\frac{12}{10}}$

Squaring

$\sin 2x = \frac{1}{5}$

$$\log_{10}\sin x + \log_{10}\cos x = \log_{10}\left(\frac{\sin 2x}{2}\right)$$

$$= \log_{10}\left(\frac{1}{10}\right) = -1$$

96. Ans. (1)

Sol. $\log_a(10^1.10^2.10^3.....10^8) = 72$

$a^{72} = 10^{36}$

$a = \sqrt{10}$

97. Ans. (3)

Sol. $\frac{1}{r_1}+\frac{1}{r_2}+\frac{1}{r_3}+\frac{1}{r}$

$=\frac{1}{r}+\frac{1}{r}=\frac{2}{r}$

given $\Delta = 2s$

$\frac{\Delta}{s} = 2$

$r = 2$

98. Ans. (3)

Sol. $A + B = 45°$

$\tan A + \tan B + \tan A\tan B + 1 - 1$

$= (1 + \tan A)(1 + \tan B) - 1$

$= 2 - 1 = 1$

99. Ans. (4)

Sol. $ab = 1$

$b = \frac{1}{a}$

$E = \frac{1}{a^4}+\frac{4}{b^4}$

$E = \frac{1}{a^4}+\frac{4}{(1/a)^4}$

$E = \frac{1}{a^4}+4a^4$

use AM ≥ GM upon numbers $\frac{1}{a^4}$ & $4a^4$

100. Ans. (3)

Sol. $9 < |\alpha - \beta| \le 4$

$0 < (\alpha + \beta)^2 - 4\alpha\beta \le 16$

$0 < 36 - 4b \le 16$

$5 \le b < 9$

Possible integral values of b are 5, 6, 7, 8

101. Ans. (2)

Sol. $x^2 - 12x + t = 0$ roots are α, β

$\alpha + \beta = 12$ $\quad\quad$ $\alpha\beta = t$

$\alpha + \beta = 9 + 3$ $\quad\quad$ $9 \times 3 = t$

$\Rightarrow \alpha = 9,\ \beta = 3$ $\quad\quad$ $t = 27$

102. Ans. (4)

Sol. $S_k = \frac{k}{2}(2 \times 1 + (k-1) \times 1)$

$S_k = \frac{k}{2}(k+1)$

$$\sum_{k=1}^{100} \frac{2}{k(k+1)} = \sum_{k=1}^{100} \left(\frac{2}{k} - \frac{2}{k+1} \right)$$

$$= 2 - \frac{2}{101} = \frac{200}{101}$$

103. Ans. (1)

Sol. $\frac{|-2-1-1+\lambda|}{\sqrt{(-1)^2+1^2}} = \frac{|4-3-1+\lambda|}{\sqrt{2}}$

104. Ans. (2)

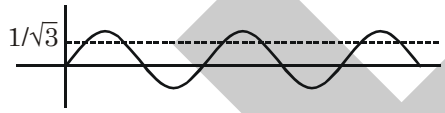
Sol. $\log_{\sin\theta} \cos 2\theta = 2$

$\sin\theta > 0, \cos 2\theta > 0, \sin\theta \neq 1$

$\cos 2\theta = \sin^2\theta$

$\sin\theta = \pm \frac{1}{\sqrt{3}}$ (reject –ve sign)

$\sin\theta = \frac{1}{\sqrt{3}}$



105. Ans. (2)

Sol. $3\log\left(\frac{a+b+c}{3}\right) = \log a + \log b + \log c$

$(a + b + c)^3 = 27abc$

use AM ≥ GM upon a, b, c

$\frac{a+b+c}{3} \geq (abc)^{1/3}$

$(a + b + c)^3 \geq 27abc$

Equality holds

$\Rightarrow a = b = c$

106. Ans. (1)

Sol. $2\cos^2 x - 3\sin x = 0$

$2(1 - \sin^2 x) - 3\sin x = 0$

107. Ans. (4)

Sol. $\cos^6x - \sin^6x$

$= (\cos^2x - \sin^2x)(\cos^4x + \sin^4x + \cos^2x\sin^2x)$

$= \cos2x(1 - \sin^2x\cos^2x)$

$$\cos2x(1-\sin^2x\cos^2x)+\frac{4\sin^2x\cos^2x}{4}\cos2x=0$$

$\cos2x(1 - \sin^2x\cos^2x) + \sin^2x\cos^2x\cos2x = 0$

$\Rightarrow \cos2x = 0$

$2x = (2n + 1)\frac{\pi}{2}$

$x = (2n + 1)\frac{\pi}{4}$ $\quad n \in I$

108. Ans. (1)

Sol. $R = 2r$

$\Rightarrow$ triangle is equilateral

$r = 4R\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

$r_1 = 4R\sin\frac{A}{2}\cos\frac{B}{2}\cos\frac{C}{2}$

Put $\angle A = \angle B = \angle C = \frac{\pi}{3}$

109. Ans. (2)

Sol. Equation of normal at $(-2, -1)$

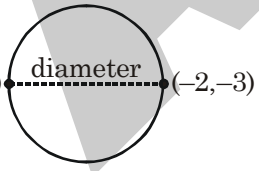
$(y + 1) = -1(x + 2)$

$y + x + 3 = 0$

solve $x + y + 3 = 0$ and $y = 2x$

and find centre, radius

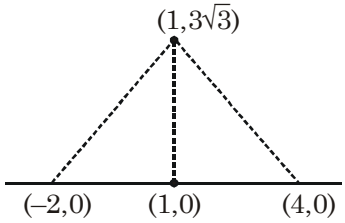
110. Ans. (1)

Sol. 

$r = \frac{1}{2}\sqrt{9+9} = \frac{3}{\sqrt{2}}$

111. Ans. (3)

Sol.



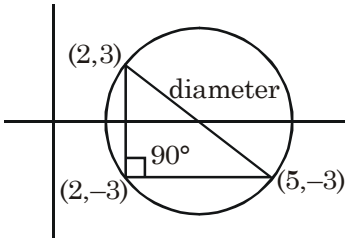
Circum centre = Centroid

$$=\left(\frac{-2+4+1}{3}, \frac{0+0+3\sqrt{3}}{3}\right)$$

$$=\left(1, \sqrt{3}\right)$$

112. Ans. (4)

Sol.



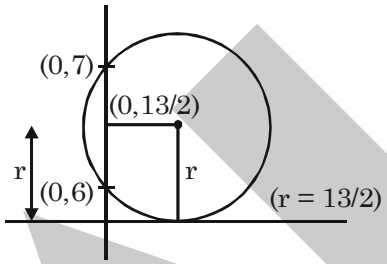
Equation of circle

$(x - 2)(x - 5) + (y - 3)(y + 3) = 0$

Now check options for which $S_1 > 0$

113. Ans. (2)

Sol.



114. Ans. (2)

Sol. $c(x - 2) - (y + 3) = 0$

point at which lines are concurrent = (2, –3)

$$p = \frac{|3 \times 2 - 4 \times 3 - 9|}{5}$$

115. Ans. (3)

Sol. $\begin{vmatrix} 2 & 3 & -5 \\ t^2 & t & -6 \\ 3 & -2 & -1 \end{vmatrix} = 0$

116. Ans. (2)

Sol. $\alpha + 2(\alpha + 1) - 1 > 0 \cap 2\alpha + 4(\alpha + 1) - 14 < 0$

117. Ans. (1)

Sol. $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

$\dfrac{\sqrt{3}}{2} = \dfrac{4 + 3 - a^2}{2 \times 2 \times \sqrt{3}}$

$a = 1$

Now use

$r = \dfrac{\Delta}{s}$

Where $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

$s = \dfrac{a+b+c}{2}$

$a = 1, b = 2, c = \sqrt{3}$

118. Ans. (1)

Sol. Given determinant

$$\begin{vmatrix} 2a & 4 & 1 \\ 2b & 4 & 1 \\ 2c & 4 & 1 \end{vmatrix} + \begin{vmatrix} 2a & a^2 & 1 \\ 2b & b^2 & 1 \\ 2c & c^2 & 1 \end{vmatrix}$$

$$8\begin{vmatrix} a & 1 & 1 \\ b & 1 & 1 \\ c & 1 & 1 \end{vmatrix} + 2\begin{vmatrix} a & a^2 & 1 \\ b & b^2 & 1 \\ c & c^2 & 1 \end{vmatrix}$$

$$= 2\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$$

$= 2(a-b)(b-c)(c-a)$

119. Ans. (3)

Sol. Expand about 1^{st} row

120. Ans. (2)

Sol. $\cos^2 27 + \sin^2 27 + 2\sin 27° \cos 27° = p^2$

$\sin 54 = 1 - p^2$

$\cos 54 = \sqrt{1 - \sin^2 54}$

$\cos 54 = \sqrt{1 - (1 - p^2)^2}$