Sri Chaitanya Educational Institutions, India.,

✪ A.P ✪ T.S ✪ KARNATAKA ✪ TAMILNADU ✪ MAHARASTRA ✪ DELHI ✪ RANCHI

A right Choice for the Real Aspirant

Central Office – Bangalore, Karnataka

Sec: ALL SENIORS (ICON) Date: 26-05-2022

Time: 70Mins KCET GRAND TEST-12 Max. Marks: 60M

MATHEMATICS

1) 3	2) 4	3) 3	4) 3	5) 2	6) 1	7) 4	8) 2	9) 1	10) 2
11) 4	12) 2	13) 1	14) 2	15) 2	16) 2	17) 1	18) 4	19) 3	20) 4
21) 3	22) 1	23) 1	24) 1	25) 1	26) 3	27) 2	28) 1	29) 4	30) 1
31) 1	32) 4	33) 2	34) 1	35) 4	36) 1	37) 1	38) 3	39) 4	40) 1
41) 4	42) 2	43) 4	44) 4	45) 2	46) 3	47) 3	48) 3	49) 2	50) 1
51) 1	52) 1	53) 2	54) 1	55) 2	56) 1	57) 2	58) 3	59) 3	60) 1

PHYSICS

61) 3	62) 2	63) 4	64) 1	65) 3	66) 1	67) 1	68) 2	69) 1	70) 3
71) 1	72) 2	73) 2	74) 4	75) 2	76) 1	77) 3	78) 4	79) 1	80) 3
81) 1	82) 4	83) 1	84) 4	85) 3	86) 1	87) 2	88) 3	89) 2	90) 1
91) 2	92) 2	93) 2	94) 3	95) 3	96) 2	97) 1	98) 1	99) 3	100) 4
101) 2	102) 4	103) 2	104) 3	105) 3	106) 2	107) 3	108) 2	109) 3	110) 3
111) 2	112) 3	113) 1	114) 3	115) 1	116) 1	117) 2	118) 1	119) 3	120) 1

CHEMISTRY

121) 3	122) 4	123) 2	124) 3	125) 3	126) 1	127) 3	128) 3	129) 4	130) 2
131) 3	132) 2	133) 2	134) 3	135) 2	136) 4	137) 3	138) 2	139) 3	140) 2
141) 1	142) 2	143) 4	144) 3	145) 3	146) 1	147) 4	148) 2	149) 3	150) 3
151) 4	152) 4	153) 3	154) 1	155) 1	156) 2	157) 3	158) 4	159) 2	160) 3
161) 4	162) 1	163) 1	164) 4	165) 2	166) 1	167) 3	168) 1	169) 3	170) 2
171) 2	172) 2	173) 1	174) 1	175) 1	176) 3	177) 3	178) 2	179) 3	180) 3

MATHEMATICS HINTS

1. Key:3

$$p(A\cap B)=P(A).P(B)$$

$$p(A\cup B^{C})=P(A)+P(B^{C})-P(A)P(B^{C})$$

$$0.8=P(A)+\frac{5}{7}-P(A)\frac{5}{7}$$

$$P(A)=0.3$$

2. Key:4

use,

$$\tan^{-1}(x)+\cot^{-1}(x)=\frac{\pi}{2}$$

3. Key:3

$$A=\int_0^1\left(\sqrt{x}-x\right)dx=\frac{1}{6}$$

4. Key:3

$key:3$

$$\int_0^{1000}e^{x-[x]}dx=1000\int_0^1 e^{x}dx=1000\left(e-1\right)$$

5. key:2 verify

6. key:1

$$a^2+b^2+2ab\cos\theta=a^2+b^2$$

$$\cos\theta=0\Rightarrow\theta=90^0$$

7. key:4

$$A^2-4A-5I=O\Rightarrow A\left(A-4I\right)=5I$$

$$\Rightarrow A^{-1}=\frac{1}{5}\left(A-4I\right).$$

8. key:2

$$\boxed{1}\rightarrow\quad for\quad n(A)=1$$

$$\boxed{2},1\rightarrow\quad for\quad n(A)=2$$

$$\boxed{5},3,2\rightarrow\quad for\quad n(A)=3$$

$$\boxed{15},10,7,5\rightarrow\quad for\quad n(A)=4$$

9. key:1

$$y\log x=\left(x-y\right)\log 5$$

$$\frac{y}{x}+\log x.\frac{dy}{dx}=\left(1-\frac{dy}{dx}\right)\log 5$$

$$\frac{dy}{dx}\left(\log x+\log 5\right)=\log 5-\frac{y}{x}$$

$$\frac{dy}{dx}=\frac{x\log 5-y}{x\left(\log x+\log 5\right)}=\frac{x\log 5-y}{x\log 5x}$$

10. key:2

$$2^m-2^n=224$$

$$2^n\left(2^{m-n}-1\right)=2^5\times 7$$

$$2^n\left(2^{m-n}-1\right)=2^5\left(2^3-1\right)$$

$$n=5 \qquad \begin{array}{l} m-n=3 \\ \Rightarrow m=8 \end{array}$$

11. key:4

$$\left(\frac{dy}{dx}\right)=(1)\left(1+x^2\right)\left(1+x^4\right)+(1+x)(2x)\left(1+x^4\right)+(1+x)\left(1+x^2\right)\left(4x^3\right)$$

$$\left(\frac{dy}{dx}\right)_{at\ x=1}=28$$

12. key:2

$$6x+4x\frac{dy}{dx}+4y+4y\frac{dy}{dx}+1=0$$

$$\frac{dy}{dx}=\frac{-\left(6x+4y+1\right)}{4x+4y}$$

$$\left(\frac{dy}{dx}\right)_{(-1,3)}=\frac{-\left(-6+12+1\right)}{-4+12}$$

$$=\frac{-7}{8}$$

13. key:1

$$\lim_{n\to\infty}\frac{3.2^{n+1}-4.5^{n+1}}{5.2^n+7.5^n}=\lim_{n\to\infty}\frac{5^n\left[3.\left(\frac{2}{5}\right)^n.2-4.5\right]}{5^n\left[5.\left(\frac{2}{5}\right)^n+7\right]}$$

$$=\frac{3\left(\frac{2}{5}\right)^\infty.2-20}{5\left(\frac{2}{5}\right)^\infty+7}=-\frac{20}{7}\left(\because (a)^\infty\to 0 as 0<a<1\right)$$

14. key:2

Limit $= \lim_{x \to 0}\left(\frac{\sin\left(\pi \cos^2 x\right)}{x^2}\right)$

$= \lim_{x \to 0}\left(\frac{\cos\left(\pi \cos^2 x\right) \times -\pi \sin 2x}{2x}\right)$

$= \lim_{x \to 0}\left(-\pi \cos\left(\pi \cos^2 x\right) \times \frac{\sin 2x}{2x}\right)$

$= \left(-\pi \cos(\pi)\right)$

$= \pi$

15. key:2

$f(0) = 2K$

Since, the given function is continuous

$\lim_{x \to 0} f(x) = f(0) \Rightarrow \lim_{x \to 0} \frac{3\sin \pi x}{5x} = 2K$

$\Rightarrow \frac{3}{5} \lim_{x \to 0} \frac{\sin \pi x}{\pi x} \times \pi = 2K$

$\Rightarrow \frac{3}{5}\pi = 2K \Rightarrow K = \frac{3\pi}{10}$

16. key:2

$\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$

$= \frac{\pi}{3} - \frac{2\pi}{3}$

$= \frac{-\pi}{3}$

17. key: 2

$here\, e = 0, 3^{-1} = 3, 4^{-1} = 2$

$\left(3^{-1} * 4^{-1}\right) * 2$

$= (3 * 2) * 2$

$= 5 * 2$

=1

18. key: 4 $f^1(x) > 0 \Rightarrow x^2.e^{-x}.(-1) + e^{-x}.2x > 0$

19. key: 3 $\int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\sin x}{4+3\cos x}\right) dx = \int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\cos x}{4+3\sin x}\right) dx = 0$

20. key: 4 degree not defined

21. key:3

Integrating factor $= e^{\int P(x)dx} = e^{\int \frac{-1}{x}dx} = \frac{1}{x}$

22. key:1

$$\int \frac{xdx}{\sqrt{1-x^2}} + \int \frac{ydy}{\sqrt{1-y^2}} = 0$$

$$\Rightarrow \sqrt{1-x^2} + \sqrt{1-y^2} = c$$

23. key:1 $f^1(x) > 0$ $3x^2 - 2ax + 48 > 0$

$\Delta < 0$

24. key:1

$$\left[\overline{a}\overline{b}\overline{c}\right] = \left[\overline{b}\overline{c}\overline{a}\right] = \left[\overline{c}\overline{a}\overline{b}\right] = 1$$

$LHS = 1+1-1 = 1$

25. key: 1 $\cos 15° \cos 7\frac{1}{2}° = \frac{\left(2\sin 7\frac{1}{2}° \cos 7\frac{1}{2}°\right)\cos 15°}{2}$

$= \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$

26. key: 3 $\frac{1+i(\cos\theta)}{1+4\cos^2\theta} \times (1+2i\cos\theta) = \frac{1+3i\cos\theta - 2\cos^2\theta}{1+4\cos^2\theta}$ is real

If $\frac{3\cos\theta}{1+4\cos^2\theta} = 0$ $\Rightarrow \theta = 2n\pi \pm \frac{\pi}{2}$

27. key:2

$$\left|\overline{a} \times \overline{b}\right| = 1 \Rightarrow \left|\overline{a}\right|\left|\overline{b}\right| \sin\theta = 1$$

$$\Rightarrow 3 \times \frac{\sqrt{2}}{3} \sin\theta = 1$$

$$\Rightarrow \theta = \frac{\pi}{4}$$

28. key:1 conceptual

29. key: 4 $(\overline{a} \times \overline{j}).(2\overline{j} - 3\overline{k}) = -3(\overline{a}.\overline{i}) = -12$

30. key:1

$$use, \frac{x}{x^2-4x+8} = \frac{k(2x-4)+l}{x^2-4x+8}$$

$k = \frac{1}{2} l = 2$

31. key:1

$$\tan(P/2) + \tan(Q/2) = -\frac{b}{a}, \tan(P/2)\tan(Q/2) = \frac{c}{a}$$

$$\tan\left(\frac{P+Q}{2}\right)=\tan\left(\frac{\pi}{2}-\frac{R}{2}\right)\Rightarrow\tan\left(\frac{P+Q}{2}\right)=\tan\frac{\pi}{4}\Rightarrow\frac{\tan(P/2)+\tan(Q/2)}{1-\tan(P/2)\tan(Q/2)}=1$$

$$\Rightarrow\frac{-b/a}{1-c/a}=1\Rightarrow\frac{-b}{a-c}=1\Rightarrow -b=a-c\Rightarrow a+b=c.$$

32. key:4

any line perpendicular to, $ax+by+c=0,$

$is bx-ay+k=0$

33. key: 2 $d=\frac{|4+9-4+5|}{\sqrt{4+9+1}}=\sqrt{14}$

34. key: 1 $I=2(\sin^{-1}(x))_0^{\frac{1}{2}}=\frac{\pi}{3}$

35. key:4

$\left[n(A)\right]^{n(A\times A)}=3^9$

36. key:1

$$\frac{dx}{d\theta}=e^{\theta}\left[\cancel{\cos\theta}+\sin\theta+\sin\theta-\cancel{\cos\theta}\right]$$

$$\frac{dy}{d\theta}=e^{\theta}\left[\cos\theta-\cancel{\sin\theta}+\cancel{\sin\theta}+\cos\theta\right]$$

$$\frac{dy}{dx}=\cot\theta \quad \left(\frac{dy}{dx}\right)\text{at } \theta=\frac{\pi}{4}=1$$

37. key:1

sol

$$y(I.F)=\int Q(x)(I.F)dx$$

$$y(x^2-1)=\int 1dx+c$$

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

38. key:3 $req.area=\int_2^4(1+\frac{8}{x^2})dx=4$

39. key:4

$$P(E_1)=P(E_2)=\frac{1}{2}\ P(A/E_1)=\frac{3}{7}\ P(A/E_2)=\frac{5}{11}$$

$$P(E_2/B)=\frac{\frac{1}{2}\times\frac{5}{11}}{\frac{1}{2}\times\frac{3}{7}+\frac{1}{2}\times\frac{5}{11}}=\frac{35}{68}$$

40. key:1

$Z = x + 3y$

$x + 4y \le 5$

$Z_{\max} = 5, at(5,0)$

41. 4

$11t_{11} = 7t_7$

$\Rightarrow t_{18} = 0$

$\Rightarrow a + 17d = 0$

$\Rightarrow s_{35} = \frac{35}{2}[2a + 34d] = 0$

42. key:2

$P(E) = {}^{10}C_6 (\tfrac{1}{2})^6 (\tfrac{1}{2})^4 = \frac{105}{512}$

43. key: 4

5girls are arranged in $5!$ ways where as in 6 Gaps 3 boys can be arranged in ${}^6p_3$ ways.

$\therefore$Number of ways $= 5! \times {}^6p_3 = 14400$

44. key:4 $\sum r(r)! = \sum_{r=1}^{r=n} r(r+1-1)! = (n+1)! - 1$

45. key:2

$\sin 20^\circ . \sin(60^\circ - 20^\circ) \sin(60^\circ - 20^\circ) . \frac{\sqrt{3}}{2}$

$= \frac{1}{4} \sin 3(20^\circ) . \frac{\sqrt{3}}{2} \quad \left(\because \sin A . \sin(60 - A) \sin(60 + A) = \frac{1}{4} \sin 3A \right)$

$= \frac{1}{4} . \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = \frac{3}{16}$

46. key:3 $H\text{int}: put, x = \cos\theta$

47. key: 3

For the expression $|x+4| > 0$ and

$x \ne -4, (x-1)(x+7) \le 0$

$1 \le x \le 7$

$x \in [-7, -4) \cup (-4, 1]$

48. key: 3 any point in 4th octant is of the form$(+,-,+)$

49. key: 2

$\sqrt{1 - \sin^2 100^0} \times \sec 100^0 = -\cos 100^0 \times \sec 100^0 = -1$

50. key: 1

$$variance = \frac{n^2-1}{12} = \frac{10^2-1}{12} = \frac{33}{4}$$

51. key:1

$$\underset{x \to 1}{Lt} f(x) - 2 = \pi \underset{x \to 1}{Lt} x^2 - 1$$

$$\underset{x \to 1}{Lt} f(x) = 2$$

52. $$\lim_{x \to 0} \frac{1-\cos 2x}{x \tan x} = \lim_{x \to 0} \frac{2\sin^2 x}{x^2 \frac{\tan x}{x}} = 2$$

53. key:2 $x^2 - 36 = 36 - 36 \Rightarrow x = \pm 6$

54. key: 1

The area bounded between $y^2 = 4ax$ and $x^2 = 4ay$ is $A = \frac{16ab}{3}$

Standard result (memorise)

55. key: 2

$(\bar{a} + \lambda \bar{b}).\bar{c} = 0$

$\Rightarrow \lambda = 2$

56. key:1

$p = 5, dr's = (\frac{6}{7}, \frac{-2}{7}, \frac{-3}{7})$

equation, of line

$$\frac{6}{7}x - \frac{2}{7}y - \frac{3z}{7} = 5$$

57. key:2

$$\frac{\alpha-7}{2} = \frac{\beta-14}{4} = \frac{\gamma-5}{-1} = \frac{-[2(7)+14(4)-5-2]}{4+16+1}$$

$\Rightarrow (\alpha, \beta, \gamma) = (1,2,8)$

58. key:3

$$\frac{d}{dx}\left(6\tan^{-1}x\right) = 6.\frac{d}{dx}\tan^{-1}x$$

$$= \frac{6}{1+x^2}$$

59. key:3

$$|\beta| = 1 \Rightarrow \beta = \frac{1}{\bar{\beta}}$$

$$\frac{|\beta-\alpha|}{\left|1-\left(\frac{\bar{\alpha}}{\beta}\right)\right|}=\frac{|\beta-\alpha|}{|\overline{\beta-\alpha}|}\times|\beta|=1$$

60. key:1 $P(E_1)=P(E_2)=\frac{1}{2}$ $P(B/E_1)=\frac{4}{5}$

$$P(B/E_2)=\frac{1}{5}, P(E_1/B)=\frac{\frac{4}{5}\times\frac{1}{2}}{\frac{4}{5}\times\frac{1}{2}+\frac{1}{5}\times\frac{1}{2}}=\frac{4}{5}$$

PHYSICS HINTS

61. $\lambda=6.5\times10^{-3}m, d=1mm=10^{-3}m, D=1m$

$$y_{5B}=\frac{5\lambda D}{d}------>(1),$$

$$y_{3D}=\frac{(2m-1)\lambda D}{2d}=\frac{5\lambda D}{2d}---->(2)$$

$$y_{5B}-y_{3D}=\frac{5\lambda D}{2d}$$

62. Conceptual

63. $m=\frac{h_i}{h_0}=-4.5$

$$u=-20cm;\ m=\frac{-u}{u}=-4.5$$

$$\frac{-v}{-20}=-4.5$$

$$v=-90cm$$

$$\therefore \frac{1}{f}=\frac{1}{4}+\frac{1}{v}\Rightarrow\frac{1}{f}=\frac{-1}{20}-\frac{1}{90}$$

$$f=\frac{-180}{11}cm$$

$$f=\frac{180}{11}cm$$

64. $i=45^0;\ r=30^0$

$$\mu_{21}=\frac{\sin i}{\sin s}=\frac{\frac{1}{\sqrt{2}}}{\frac{1}{2}}=\frac{2}{\sqrt{2}}=\sqrt{2}$$

65. $P = i_{rms}^2 (R), R = 0 \therefore P = 0$

66. $KE = P.E$

$$\cancel{q_1}.V = \frac{1}{4\pi \in_0}.\frac{\cancel{q_1}.q_2}{r}$$

$$r = \frac{1}{4\pi \in_0}.\frac{q_2}{v}$$

V is same, so r is same

67. $\lambda = \frac{h}{\sqrt{2mev}} = \frac{12.27}{\sqrt{v}} A^0$

68. $\phi_A = \phi : \phi_B = 2\phi$

$E = \phi + KE_{\max}$

$E_A = \phi_A + KA \; E_B = \phi_B + KB$

$hf = \phi + KA \rightarrow 1 \; 2hf = 2\phi + KB \rightarrow 1$

$2[\phi + KA] = 2\phi + K_B$

$2\phi + 2K_A = 2\phi + K_B$

$$\frac{K_A}{K_B} = \frac{1}{2}$$

69. Conceptual

70. Conceptual

71. $T \alpha R^{3/2}$

$$\frac{T_2}{T_1} = \left(\frac{R_2}{R_1}\right)^{3/2}$$

$$\frac{T_2}{T_1} = \left(\frac{\cancel{R_1}}{\cancel{R_1}}\right)^{3/2}$$

$T_2 = T_1 (4)^{3/2} = 8T_1 \, (T_1 = 1 day)$

$\therefore T_2 = 8 \; days$

72. Conceptual

73. Density is Independent of mass

74. $W = vq = ve; \; v = \frac{w}{e} = \frac{E}{e}$

$E_{(n=1)} = -13.6\ ev \quad E_{(n=2)} = -3.4 ev$

$E_2 - E_1 = +10.2\ ev$

Potential = $\frac{10.2\cancel{e}v}{\cancel{e}} = 10.2\ valts$

75. Wave number $= \frac{1}{\lambda}$

$\frac{1}{\lambda} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\frac{1}{\lambda} = R\left[\frac{1}{4} - \frac{1}{16}\right] = \frac{3R}{16}$

76. First diode in Reverse bias.

77. $\frac{\Delta Q}{Q}\times 100 = 3\left[\frac{\Delta A}{A}\times 100\right] + 3\left[\frac{\Delta B}{B}\times 100\right] + \frac{\Delta C}{C}\times 100 + \frac{1}{2}\left[\frac{\Delta D}{D}\times 100\right]$

$= 3\times 2\% + 3\times 1\% + 1\times 3\% + \frac{1}{2}\times 4\%$

$= 6\% + 3\% + 3\% + 2\%$

$= \pm 14\%$

78. $i = 10\ mA = 10\times 10^{-3} amp = 0.01\, amp$

$(V+2) = 6$

$V = 4\ volts$

$v = iR \Rightarrow R = \frac{V}{i} = \frac{4}{0.01} = 400\Omega$

79. Conceptual

80. Conceptual

81. Conceptual

82. $h = \frac{u^2}{2g} = 10$

$u^2 = 2g\times 10 = 2\times 10\times 10$

$u = 10\sqrt{2}$

$t = \frac{u}{g} = \frac{10\sqrt{2}}{10} = \sqrt{2}$

$u = 10\, m/s$

Horizontal distance = $u\times t$

$=10\sqrt{2}\times\sqrt{2}=20\,ms$

83. $S\alpha u^2$

84. Conceptual

85. $I_{Hollow}=I_{sphere}$

$\frac{\cancel{2}}{3}\cancel{M}R_H^2=\frac{\cancel{2}}{5}\cancel{M}R_s^2$

$\left(\frac{R_H}{R_S}\right)^2=\frac{3}{5}$

$R_H:R_S=\sqrt{3}:\sqrt{5}$

86. Mass is independent of acceleration due to gravity so M=constant

87. One second hand covers 360^0 in 1min

One hour hand covers 360^0 in 12hours

$\omega_s=\frac{2\pi}{1\min}=\frac{2\pi}{60\sec};\omega_b=\frac{2\pi}{12\,hour}=\frac{2\pi}{12\times60\times10}$

$\frac{\omega_n}{\omega_s}=\frac{\cancel{2\pi}}{12\times60\times\cancel{60}}\times\frac{\cancel{60}}{\cancel{2\pi}}=\frac{1}{720}=1:720$

88. $KE=\frac{P^2}{2m}\Rightarrow KE\ \alpha\ p^2$

89. Acceleration, a = -1

$s_1=3-\frac{1}{2}(1\times1)=\frac{5}{2}$

$s_2=2-\frac{1}{2}(1\times1)=\frac{3}{2}$

$s_3=1-\frac{1}{2}(1\times1)=\frac{1}{2}$

$w_1:w_2:w_3=Fs_1:Fs_2:Fs_3=5:3:1$

90. $(PE)_{at\ mean}=5J;(T.E)=9J$

$T.E=(P.E)_{at\ mean}+(KE)_{\max}$

$9=5+KE_{(\max)}$

$(KE)_{Max}=4J$

$\frac{1}{2}mv^2{}_{\max}=4$

$$V_{\max} = \sqrt{\frac{2\times 4}{m}}$$

$$V_{\max} = 2\, m/s$$

$$V_{\max} = AW$$

$$2 = 0.01\times W$$

$$w = 200$$

$$\frac{2\pi}{T} = 200$$

$$T = \frac{\pi}{100}$$

91. $Q_{steam} = mL_s = 6\times 540 = 3240\ cal$

$$Q_i = mL_i + m\,c\Delta\, t$$

$$= 6\times 80 + 6\times 1\times 100 = 1080\ cal$$

$$\therefore condensed\ mass \Rightarrow m\times 540 = 1080$$

$$m = 2 grams$$

92. Conceptual

93. $w = P.\Delta v$

$$= 2\times(10-5)$$

$$= 2\times 5$$

$$= 10\ \ lit.atm$$

$$1\, lit - atm = 101.3\ Jouls$$

$$w = 10\times 101.3 = 1013 J$$

$$\cong 1000$$

94. Conceptual

95. $P.E\,(4) = -PE\ \cos\theta$

$$u_{\min} = -PE,\ when\ \cos\theta = 1$$

$$\theta = 0^0$$

96. Conceptual

97. When keep in contact charge share equally $Q_1^1 = Q_2^1 = \frac{60-20}{2} = 20c = \frac{40}{2} = 20c$

$\therefore F = \dfrac{9\times10^{9}\times20\times20}{\left(10\times10^{-2}\right)^{2}}$

98. Conceptual

99. $n_B = 384\ H_z$

$n_A = n_B \pm 4$

$n_A = 388\,(or)\,380\ H_z$

100. $R = \dfrac{\rho l}{A}$

101. $i = \dfrac{V_{net}}{R_{eq}} = \dfrac{3-1}{1+4\times0.5} = \dfrac{2}{3}$

102. Conceptual

103. $V = \dfrac{q}{4\pi\in_0}\left[1+\dfrac{1}{2}+\dfrac{1}{2^2}+\dfrac{1}{2^3}+----\right]$

104. $u = \dfrac{1}{4\pi\in_0}\dfrac{q_1.q_2}{r}+\dfrac{1}{4\pi\in_0}\dfrac{q_2q_3}{r}+\dfrac{1}{4\pi\in}\dfrac{q_1q_3}{r}$

105. Conceptual

106. Charging $v = \left(E+ir\right) = 6+1\times1 = 7volts$

107. $r = \dfrac{mv}{Bq} = \dfrac{v}{B\left(e/m\right)}$

108. $B = \dfrac{\mu_0\pi n^2 i}{\ell}$

$B\alpha n^2$

$\dfrac{B_1}{B_2} = \dfrac{n_1^2}{n_2^2} = \dfrac{\overset{3}{\cancel{9}}\times\overset{3}{\cancel{9}}}{\cancel{3}\times\cancel{3}} = 9:1$

109. $R_t = R_0\left(1+\alpha t\right)$

110. $Cos\left(1\right)\Rightarrow\dfrac{P}{Q} = \dfrac{R}{S} = \dfrac{500}{S}\rightarrow\left(1\right)$

$Cos\left(2\right)\Rightarrow\dfrac{Q}{P} = \dfrac{R}{S} = \dfrac{505}{S}\rightarrow\left(2\right)$

$(1)\times(2)\quad 1 = \dfrac{500\times505}{S^2}\Rightarrow S^2 = 500\times505$

$S = \sqrt{500\times505}$

$= 502.5\Omega$

111. $KE_{(r)} = \frac{1}{2} I\omega^2 , \left(I = \frac{MR^2}{2} \right)$

$= \frac{1}{2} \left(I = \frac{MR^2}{2} \right) \omega^r = 8$

$\frac{1}{2} \left(\frac{M}{2} \right) (R\omega)^2 = 8$

$\frac{1}{2} \times \frac{\cancel{2}}{\cancel{2}} \times (V_{cm})^2 = 8$

$V_{cm}^2 = 16$

$V_{cm} = 4m/s$

112. $n = \frac{1}{2\pi} \sqrt{\frac{I}{M_B}} , n \alpha \sqrt{I}$

113. $f = \frac{\mu_0 i_1 i_2 \, l}{2\pi \, \alpha}$ find f_{BA} *and* f_{BC}

$\therefore$ Then $f_R = f_{BA} \sim f_{BC}$

114. $S = \frac{G}{\frac{i}{i_g} - 1} \left(i_g = \frac{1}{11} i \right)$

115. Conceptual

116. $\eta = \frac{P_{out}}{P_{in}} = \frac{V_s I_s}{V_p I_p}$

117. At resonance $\chi_L = x_C$

118. e.m.f $e = B_v.l.v$

$Tan\, 30^0 = \frac{Bv}{B_H}$

$B_v = B_H \tan 30^0$

119. $e = -M \frac{dI}{dt}$

$e = \frac{-5 \times (0-5)}{10^{-3}} = 25 \times 10^3$

$= 25000$ v

120. Conceptual

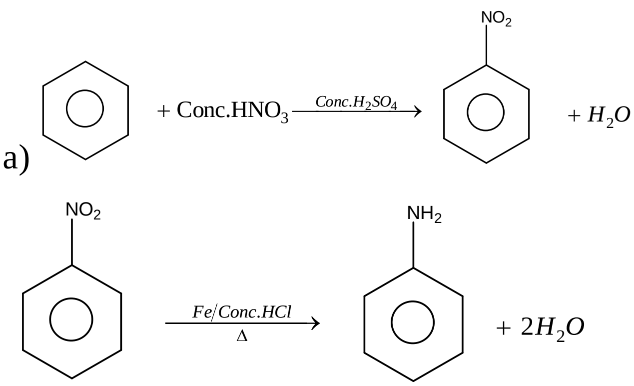
CHEMISTRY HINTS

121. Glucose has 1 and Fructose has 2 primary alcoholic – OH groups.

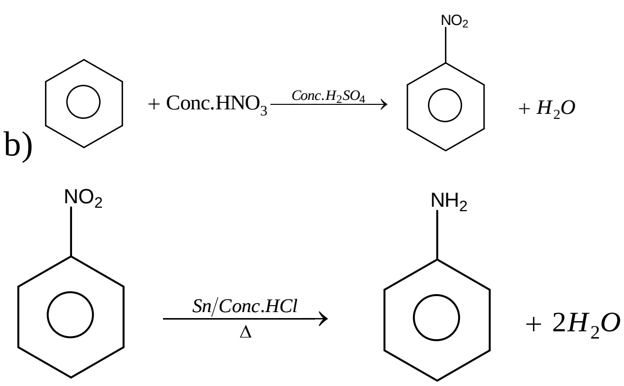
122. During denaturation, the sequence of amino acids is not changed. So, no change in primary $\left(1^0\right)$ structure of protein.

123. Tranquilisers – specifically known as sedatives or depressants.

124. a)

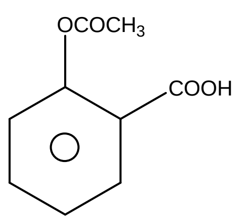


b)



125. Cannizaro reaction.

126. Aspirin is 2-acetoxy Benzoic acid.



127. During dehydration, alcohols behave as bases. So, alcohol has to be treated with a strong acid such as sulphuric acid or phosphoric acid.The temperature to be maintained decreases with the increase in substitution of the alcoholic - OH containing Carbon. Dehydration of 3^0–alcohols can be carried out in the temperature range of 25^0C to 80^0C.

128. Major product in accordance with Markownikoff's rule is (3) as 2^0 – Carbocation is

more stable than1^0 –Carbocation.

129. Orlon, acrylon are the other names for polyacrylonitrile.

130. Nylons are polyamides with high tensile strength. Polyamides contains recurring amide groups (R-CO-NH-R') as integral parts of the main polymer chain.Polyesters contain the ester functional group in every repeating unit of the main chain $\left(-O-\overset{\overset{O}{\|}}{C}-R\right)_n$

$CH_2 = CH - COOH$ is acrylic acid or propenoic acid. Polymers of esters of acrylic acid are polyacrylates like PMMA. Resins are usually mixtures of organic compounds of plant or synthetic origin that is convertible into polymer.

131. Malachite - $CuCO_3.Cu(OH)_2$

Azurite - $2CuCO_3.Cu(OH)_2$

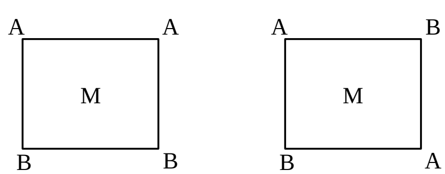
Sphalerite - ZnS

Chalcopyrite - $Cu_2Fe_2S_4$

132. Cl^- is oxidized to Cl_2. So, H_2O should be reduced to H_2 and OH^-.

133. Iron is the material that is extracted. It should not be lost as slag of $FeSiO_3$. So, the unwanted SiO_2 is preferentially made to combine with CaO obtained from $CaCO_3$ the basic flux, by decomposition, to form $CaSiO_3$.

134.



Cis complex   trans complex

135. In tetrahedral arrangement, the relative positioning of ABCD ligands is the same, even if we change their positions. But, it is not the same in either square planar or in octahedral arrangement.

136. Enthalpy of atomization is proportional to metallic bond strength. Due to the involvement of only $2\ e^{-1}$ in metallic bonding, weak metallic bond is noticed in Zinc. So, Zinc is even known as volatile metal.

$3\ e^{-1}$ are involved in metallic bonding in Sc.

6 e^{-1} are involved in metallic bonding in Cr.

6 e^{-1} are involved in metallic bonding in Fe.

137. $4FeO.Cr_2O_3 + 8Na_2CO_3 + 7O_2 \xrightarrow{48e^{-1}} 2Fe_2O_3 + 8Na_2CrO_4 + 8CO_2 \uparrow$

$4Fe \xrightarrow{-4e^{-1}} 2Fe_2O_3$ *oxidation*

$\underset{+24}{4Cr_2O_3} \xrightarrow{-24e^{-1}} \underset{+48}{8CrO_3}$ *Oxidation*

$\underset{Acid}{8CrO_3} + \underset{Base}{8Na_2CO_3} \rightarrow 8Na_2CrO_4 + 8CO_2$ *Neutralisation*

$7O_2 \xrightarrow{+48e^{-1}} 14\ O^{-2}$ Reduction

So, both Fe and Cr are undergoing oxidation and oxygen is getting reduced. The whole process involves a transaction of 48 electrons.

138. Higher electronegativity of the central atom implies higher oxidizing ability.

Electronegativity of N = 3; S = 2.56 and P = 2.2.

So, 'N' of HNO_3 has highest tendency to grab electrons and get reduced. So, it is the strongest oxidant. Similarly, 'P' of H_3PO_4 has least tendency to grab electrons and get reduced. So, on relative scale, H_3PO_4 is poor oxidant.

139. Maximum covalency of 'N' is 4 ; 3 covalent bonds and one co-ordinate covalent bond.Due to inert pair effect, stable maximum oxidation state of Bi is +3 and not +5. So, Bi_2O_5 is not stable.

As the size of the central atom increases, the M-H bond energy decreases and the stability of MH_3 also decreases.

Ethyl group is electron donating. Phosphine has a lone electron pair on central phosphorous. If three 'H' of phosphine are substituted with three ethyl groups, electron density on phosphorous further increases, increasing electron donation ability. So, $P(C_2H_5)_3$ is a good ligand.

140. $E_{cell} = E_{cathode} - E_{anode}$

Given, $1.56V = E_{Ag^+/Ag} - E_{Zn^{+2}/Zn}$ .....(1)

$1.10V = E_{Cu^{+2}/Cu} - E_{Zn^{+2}/Zn}$ .....(2)

Expression for the Cell emf of the required cell is $= E_{Ag^{+}/Ag} - E_{Cu^{+2}/Cu}$

It is obtained using (1) – (2)

$1.56 - 1.10 = 0.46V = E_{Ag^{+}/Ag} - E_{Zn^{+2}/Zn}$

141. $k = Ae^{-}\left(\frac{E}{RT}\right)$ *or* $\log_e k = \log_e A - \frac{E}{RT}....(1)$

$k_C = Ae^{-}\left(\frac{E_C}{RT}\right)$ *or* $\log_e k_C = \log_e A - \frac{E_C}{RT}$ $....(2)$

$$\log_e\left(\frac{k}{k_C}\right) = -\frac{E}{RT} - \frac{E_C}{RT} = \frac{(E_C - E)}{RT}$$

$$RT\ \log_e\left(\frac{k_C}{k}\right) = (E - E_C)$$

$$(E - E_C) = 2.303RT \quad \log_{10}\left(\frac{k_C}{k}\right)$$

142. Gap along the edge between two particles $= a - 2R$

For FCC, $\sqrt{2}a = 4R$

Gap $= 2\sqrt{2}R - 2R = 2R\left(\sqrt{2} - 1\right)$

Radius of the spherical particle $= \frac{2R\left(\sqrt{2}-1\right)}{2} = R\left(\sqrt{2}-1\right)$

143. $\Delta T_f = K_f m = 1.86 \times \frac{45 \times 1000}{62 \times 600} = 2.25K$

Freezing point = $-2.25^{0}C$

144. Graph (1) depicts positive deviation. Graph (2) depicts negative deviation.

Graph (3): No solution can exhibit both positive and negative deviation.

So, graph (3) is incorrect.

145. On an average, number of moles of particles released by one mole of solute is Vant Hoff's factor.

0.6 mole electrolyte released 0.9 mole of particles.

1 mole of electrolyte releases $\frac{0.9}{0.6} = 1.5 mole\ of\ \ particles$

Vant Hoff's factor $'i' = 15$

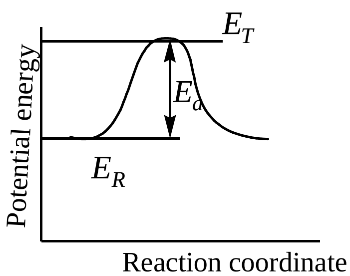
146. In rock salt structure, if a particle is at corner, it will also be present at face center. The other type of particle will occupy all 12 edge centers and one body center. If 'A' is at corner, then 'B' will be at body center.

Composition of the solid, without the removal of any particle is A_4B_4. Composition of the solid, after removal of particles along the axis is

$= A_{4-\frac{2}{8}} \quad B_{4-1} = A_{\frac{32-2}{8}} \quad B_3 \qquad\qquad = A_{\frac{30}{8}} \quad B_3 = A_{30} \quad B_{24} = A_5 \quad B_4$

147. The anion of sea water will bring about coagulation of clay.

148. As the size of colloid increases, light of higher wave length is absorbed ; emitting light of lower wave length.

149. 

150. Water gets oxidized during the electrolysis of dilute H_2SO_4.

Electrolysis of 50% H_2SO_4 forms $H_2S_2O_8$.

151. Antiseptics are chemotherapeutic drugs which are meant for external application and not for internal use such as oral intake or intravenous intake.

152. i) Usage of 'allyl' is not in accordance with IUPAC. Trivial name N-allyl methyl amine is N-methyl prop-2-en-1-amine. It is a secondary amine

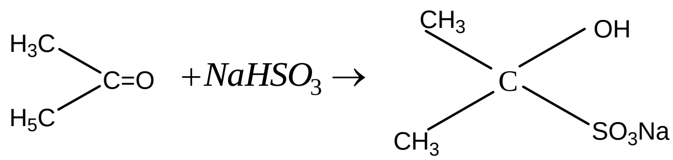
ii) $H_2C = CH - CH_2 - \underset{\underset{NH_2}{|}}{C}H - CH_3$. It is a primary amine

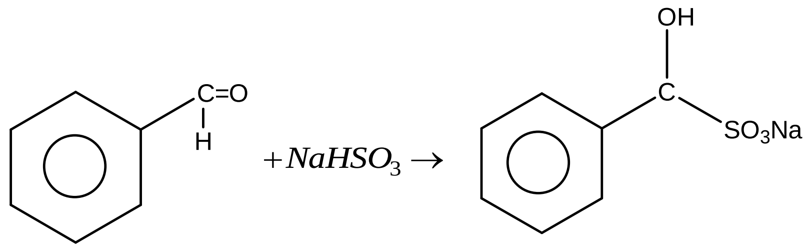
iii) 4-amino pent -1 ene is wrong naming because, amino group is prioritized compared to double bond, as per IUPAC. So, lowest locant is to be assigned to amino group and not to the double bond.

iv) Correct IUPAC name of $\underbrace{CH_2 = CH - CH_2}_{parent} NHCH_3$ is N-methyl prop-2-en-1-amine

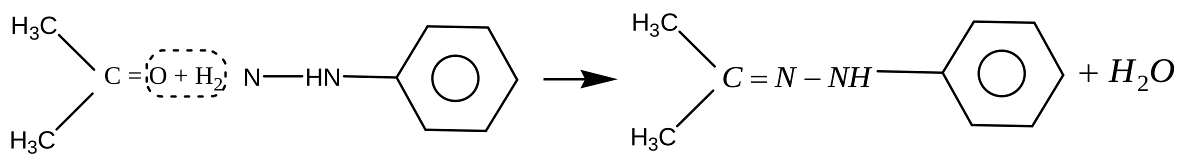
153. Carbonyl compounds react with

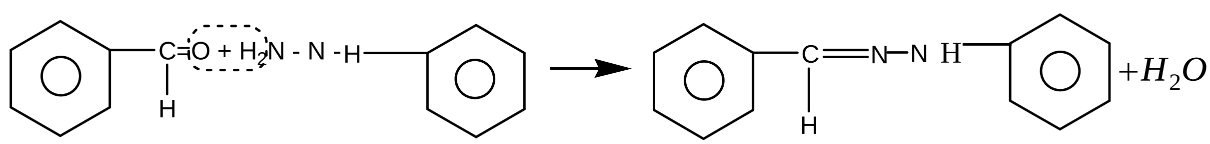
1) saturated solution of $NaHSO_3$ to form nucleophilic addition compound.





2) phenyl hydrazine to form corresponding phenyl hydrazine

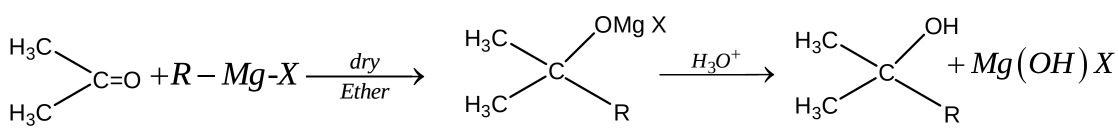




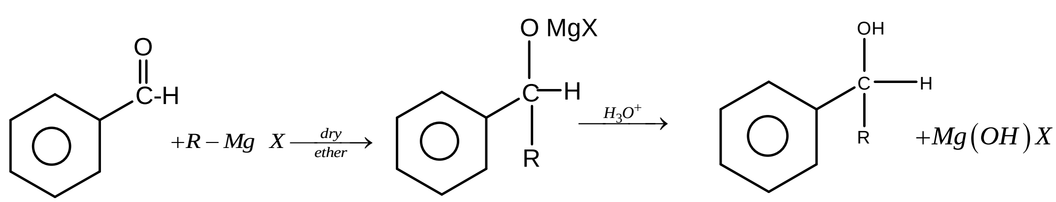
3) Fehling's solution : -

Fehlings solution can be regarded as a solution of CuO and it is a very mild oxidant. Benzaldehyde is a very mild reductant and acetone cannot be oxidized by Fehling's solution.

4) Grignard reagent with carbonyl compounds: -



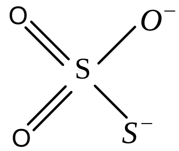
$3^0 - Alcohol$



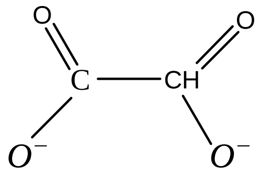
$2^0 - Alcohol$

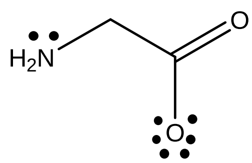
154. Boiling point is a bulk property; higher B.P is noticed, if molecular interaction is more. The three given options are isomers. Lesser the branching, greater is the B.P. Incase, if they are not isomers, higher molecular weight ensures higher B.P.

So, the correct order of B.P. is iii < i < ii

155. 1) 

Thiosulphato has two donar sites O^- and S^- but, each time only one kind of donor site is used for donation. So, it is ambidentate ligand, monodentate. It is not chelating ligand.

2)  Bidentate ligand

3)  Bidentate

4) $\ddot{N}H_2-CH_2-CH_2-\ddot{N}H_2$ *bidentate*

156. $Cr-[Ar]3d^5 4s^1$

$Cr^{+3}-[Ar]3d^3$

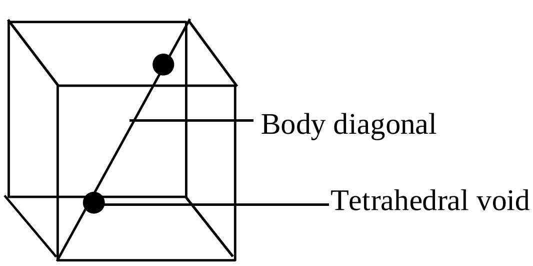
It has 3 unpaired electrons.

$\mu=\sqrt{n(n+2)}B.M=\sqrt{3(3+2)}=\sqrt{15}=3.87B.M$

157. $3H_2O+P_4+3NaOH\xrightarrow{\Delta}PH_3\uparrow 3NaH_2PO_2$

PH_3 is less basic than NH_3 because the size of the central atom increases from ‘N’ to ‘P’ decreasing the electron density on the central atom, thereby makes it a weaker base.

158. In FCC unit cell, there will be 8 tetrahedral voids. 2 tetrahedral voids are placed along each body diagonal with in the unit cell. So, along 4 body diagonals, 8 tetrahedral voids are located.



159. Comparing rates of experiment 1 with 2, we realize that rate got increased 4 times by doubling concentration of [B] from 0.3 M to 0.6 M.

$Rate = k[A]^x[B]^y$

$0.1 = k[0.3]^x[0.3]^y - Expt.1$

$0.4 = k[0.3]^x[2\times 0.3]^y - Expt.2$

Dividing (2) with (1) we get,

$4 = 2^y \quad or \quad y = 2$

Similarly,

$0.2 = k[2\times 0.3]^x[0.3]^2 - Expt.3$

Dividing (3) with (1) we get,

$2 = 2^x \quad or \quad x = 1$

Thus, the rate equation is Rate $= k[A][B]^2$

160. To measure the electrode potential, the electrode is to be coupled with SHE. SHE makes use of H_2 at 1 Bar, $\left[H^+\right]$ at 1M concentration.

Electrode potential is said to be standard electrode potential, if the concentration of solutions involved is 1M and if any gases are involved, they must be at 1 atm pressure. So, the correct cell representation is

$Pt_{(s)}\left|H_2(g,1bar)\right|H^+(aq.,1M)\|Cu^{2+}(aq.,1M)\left|Cu_{(s)}\right.$

161. Bhopal gas tragedy in 1984 was caused by chemical- methyl isocyanate $(CH_3 - N = C = O)$. Its threshold limiting value is 0.02 ppm.

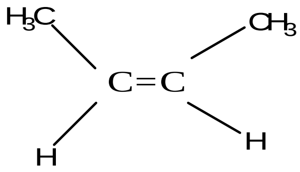
162. $\overset{+2+4-2}{CaCO_3} \rightarrow \overset{+2\ -2}{CaO} + \overset{+4\ -2}{CO_2}$

Since, there is no change in oxidation number of any element during the reaction. It is not a redox reaction.

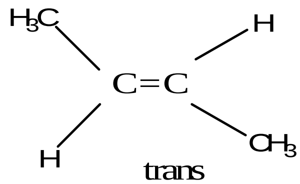
163. The role of sodalime is to remove, $-COOH$ or $-COONa$ group as it is decarboxylating agent.

$CH_3CH_2COONa \xrightarrow[\Delta]{Soda\,lime} CH_3CH_2 - H \quad (or) \quad \underset{ethane}{CH_3CH_3} + Na_2CO_3$

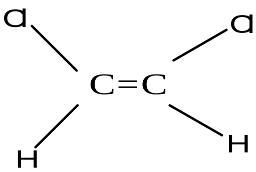
164. All three will show geometrical isomerism.



Cis



trans



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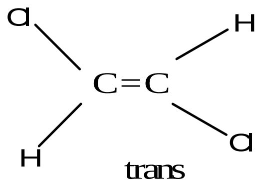
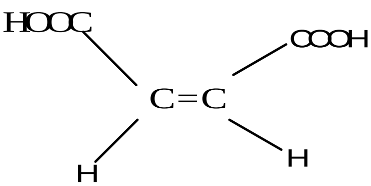


trans



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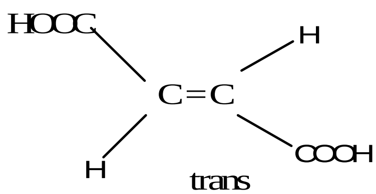

trans

165. $\underset{Hex-1-en-5-yne}{CH_2 = CH - CH_2 - CH_2 - C \equiv CH}$

166. Any metal oxide that reacts with both acid as well as base is amphoteric.

$$Al_2O_{3_{(S)}} + 6HCl_{(aq)} \rightarrow \underset{\text{Aluminium } chloride}{2AlCl_{3_{(aq)}}} + 3H_2O_{(l)}$$

$$Al_2O_{3_{(S)}} + 2NaOH_{(aq)} \rightarrow \underset{\text{Sodium aluminate}}{2NaAlO_{2_{(aq)}}} + H_2O_{(l)}$$

167. Boric acid $B(OH)_3$ and H_3BO_3 is a weak monobasic acid. It takes away OH^- group from water leaving behind H^+ ion.

168. Proton has high hydration energy due to its high charge density.

169. NH_3 has 3 N-H bonds.

To break all N-H bonds, energy required is known as atomization enthalpy which is 1158 kJ. So, N-H bond energy is $\frac{1158}{3} = 386\ kJ/mole$

170. $\frac{1}{2}N_{2(g)} + O_{2(g)} \rightleftharpoons NO_{2(g)};\ K_C = 2\times10^4$

Then K_C for the reaction $2NO_{2(g)} \rightleftharpoons N_{2(g)} + 2O_{2(g)}$ is

$$\left(\frac{1}{K_C}\right)^2 = \left(\frac{1}{2\times10^4}\right)^2 = \frac{1}{4\times10^8}$$

171. $u_{rms} = \sqrt{\frac{3p}{d}} = \sqrt{\frac{3\times 1.2\times 10^5}{4}} = 3\times 10^2 ms^{-1}$

172. SO_3 is trigonal planar. The individual bond moments cancel with each other due to the symmetry of the molecule . $\mu_{SO_3} = 0$

Dipole moment of a molecule depends upon the charge separation and the distance between the charges. As oxygen is more electronegative than nitrogen, iodine or sulphur, H_2O will have greater dipole moment.

H_2O is an angular molecule with two $O-H$ bonds at an angle of 104.5^0.

NH_3 is pyramidal. The resultant of two N-H electric dipoles is partially cancelled by the 3rd N-H bond. $\mu_{NH_3} = 1.42D$

$\mu_{HI} = 0.39D$

173. The density of alkali metals increases from Li to Cs.

Potasium is however, lighter than sodium. It is probably due to an unusual increase in atomic size of potassium from sodium.

174. Tripeptide contains two-CONH – groups.

Mass of two – CONH – groups is 86

So, $86 \equiv 0.455$

$\therefore$Mol wt of tripeptide = $\frac{86}{0.455} = 189$

175. $\lambda = \frac{h}{mv} = \frac{6.63\times 10^{-34}}{1\times 10^{-3} kg \times 100m/\sec} = 6.63\times 10^{-33} m$

176. Molar enthalpy change for graphite (ΔH)= enthalpy change for 1g$\times$ molar mass of C

So, $= \frac{-20.7}{2}\times 12 = -1.24\times 10^2\ kJ\ mol^{-1}$

177. When reaction reached the stage of equilibrium, standard Gibbs energy change will be equal to zero. $(\Delta G^0 = 0)$ as the reaction is further proceeding $\Delta G^0 < 0$.

178. The hybridization of central atom is determined by the formula

$H = \frac{1}{2}\times [V + M - C + A]$

Where, H = No. of hybrid orbitals formed

V= No. of valence electrons of central atom

M = No. of monovalent atoms linked with the central atom

C= Charge on cation

A = Charge on anion

179. Secondary carbocation is more stable than primary carbocation. (According to Markownikov's rule)

180. Let the proportion of $Cl-37$ be 'x' and $Cl-35$ be 'y'.

Average atomic mass $=\dfrac{(37\times x)+(35\times y)}{x+y}=35.5$

$35.5x+35.5y=37x+35y$

$0.5y=1.5x$

$\dfrac{x}{y}=\dfrac{0.5}{1.5}=\dfrac{1}{3}$

So, $x:y\ \ is\ \ 1:3$