SOLUTIONS & ANSWERS FOR KERALA MEDICAL ENTRANCE EXAMINATION-2012 – PAPER I
VERSION – A1

[CHEMISTRY & PHYSICS]

1. Ans: 2.24

Sol: $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$
100 g 22.4 L
at S.T.P
10 g $\rightarrow$ 2.24 L

2. Ans: 0.1 g of silver

Sol: (A) = 0.4 g
(B) = 2.8 g
(C) = 0.1 g
(D) = 3.2 g
(E) = 1.0 g

3. Ans: 2-methylpropene

Sol: $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2 \xrightarrow{\text{ozonolysis}}$
(2-methylpropene)

$$CH_3-\overset{\overset{O}{\|}}{C}-CH_3 + HCHO$$

4. Ans: C_2 molecule has bond order 2 and is diamagnetic

Sol: $C_2 = \sigma1s^2, \sigma^*1s^2, \sigma2s^2, \sigma^*2s^2, \pi2p_x^2, \pi2p_y^2$

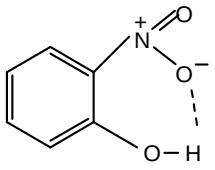
$B.O = \frac{1}{2} \times 4 = 2$

5. Ans: n l m s
2 2 1 $+\frac{1}{2}$

Sol: When n = 2
Possible values of l are 0 and 1

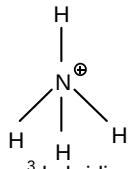
6. Ans: ortho nitrophenol

Sol:



7. Ans: tetrahedral

Sol:



sp^3 hybridised

8. Ans: 4 and 6

Sol: $n_{O_2} = 2$
$n_{Ne} = 3$
$P_{O_2} = \frac{2}{5} \times 10 = 4$ bar

9. Ans: Surface tension of a liquid increases with increase of temperature

Sol: The correct statement is surface tension of a liquid decreases with increase of temperature

10. Ans: 32%

Sol: P.F for BCC = 68%
$\therefore$ V.F = 32%

11. Ans: Pent-2-ene, β-elimination

Sol: $CH_3-\underset{\underset{Br}{|}}{CH}-CH_2-CH_2-CH_3$

$$\xrightarrow[-\ HBr]{\text{alc.KOH}} \underset{\text{Pent-2-ene}}{CH_3-CH=CH-CH_2-CH_3}$$

12. Ans: neon

Sol: Electron gain enthalpy is positive for inert gases

13. Ans: $CO + H_2$

Sol: Syngas is a mixture of CO & H_2

14. Ans: 34

Sol: Weight (g/L) = $\frac{V}{5.6} \times 17$
= 34

15. Ans: Magnetite

Sol: Magnetite is Fe_3O_4

16. Ans: Bi

Sol: Bi_2O_3 is predominantly basic

17. Ans: zone refining

Sol: High purity Ge, Si, B, Ga, In etc are prepared by zone refining

18. Ans: $CaSO_4.\frac{1}{2}H_2O$

Sol: Plaster of Paris is $CaSO_4.\frac{1}{2}H_2O$

19. Ans: H_3BO_3 and H_2

Sol: $B_2H_{6(g)} + 6H_2O_{(\ell)} \rightarrow 2B(OH)_{3(aq)} + 6H_{2(g)}$

20. Ans: 7.01

Sol: $pH = \frac{1}{2}[pK_w + pK_a - pK_b]$

$= \frac{1}{2}[14 + 4.77 - 4.75]$

$= 7.01$

21. Ans: 0.5

Sol: $K_c = \frac{1\times10^{-4}\times4.5\times10^{-4}}{(3\times10^{-4})^2}$

$= 0.5$

22. Ans: lead

Sol: Lead does not exhibit catenation

23. Ans: $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

Sol: Pressure has no effect on the equilibrium, when $\Delta n_g = 0$

24. Ans: ethyne

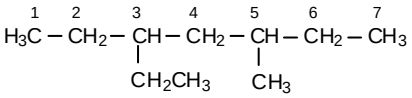
Sol: Hydrogen atoms attached to sp hybridised carbon atoms are acidic

25. Ans: Staggered > gauche > eclipsed

Sol: Staggered conformation of ethane is more stable than other conformations.

26. Ans: 3-ethyl-2-methylheptane

Sol:

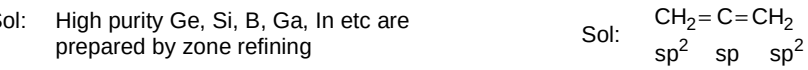


27. Ans: differential extraction

Sol: When an organic compound is present in an aqueous medium, it is separated by shaking it with an organic solvent in which it is more soluble. It is known as differential extraction

28. Ans: $CH_2 = C = CH_2$

Sol:



29. Ans: Both Li and Mg form solid hydrogen carbonates

Sol: Bicarbonates of Li and Mg do not exist in solid state

30. Ans: Zantac

Sol: Zantac (or ranitidine) is an antihistamine

31. Ans: Glycerol

Sol: Laundry soaps contain fillers like sodium silicate, sodium rosinate, borax and sodium carbonate

32. Ans: 5.6

Sol: pH of rain water is 5.6

33. Ans: $C_1 - C_4$ α-linkage

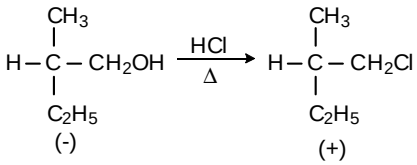
Sol: $C_1 - C_4$ α-linkage is present in amylose

34. Ans: B_{12}

Sol: Anaemia is caused by the deficiency of vitamin B_{12}

35. Ans: retention

Sol:



36. Ans:

Sol: All the given options are neutral amino acids

37. Ans: Dimethylamine

Sol: Dimethylamine is a 2° amine

38. Ans: $-NO_2$

Sol: $-NO_2$ group is meta directing and deactivating group.

39. Ans: free radical substitution

Sol: Photochemical halogenation of alkane is free radical substitution reaction

40. Ans: Freon

Sol: Freon is used as refrigerant

41. Ans: $CF_3COOH > CHCl_2COOH > HCOOH > C_6H_5CH_2COOH > CH_3COOH$

Sol: CF_3COOH is the strongest acid and CH_3COOH is the weakest among the given acids

42. Ans: Lucas test

Sol: Lucas reagent is used to distinguish 1°, 2° and 3° alcohols

43. Ans: $PdCl_2$

Sol: $CH_2{=}CH_2 + H_2O + PdCl_2 \xrightarrow[\text{air } (O_2)]{CuCl_2}$

$CH_3{-}CHO + Pd + 2\ HCl$

44. Ans: tert-butyl chloride

Sol: Boiling points of alkyl halides increase with increase in molecular weight. Among isomeric alkyl halides, boiling point decreases with branching

45. Ans: $LiAlH_4$

Sol: $LiAlH_4$ will reduce aldehydes to primary alcohols

46. Ans: Reduction of isonitriles

Sol: Reduction of isocyanides (isonitriles) give 2° amines

47. Ans: 28

Sol: % of N

$$= \frac{1.4 \times M \times 2\ (V - V_1/2)}{m}$$

$$= \frac{1.4 \times 0.5 \times 2\ (50 - 80/2)}{0.5}$$

= 28%

48. Ans: benzenamine

Sol: Benzenamine (aniline) is the weakest base due to decolalisation of the lone pair of electrons on nitrogen with the benzene ring

49. Ans: Rate = $k[A]^0\ [B]^2$

Sol: From (1) and (2), [A] has no effect on rate.
From (1) and (3), on doubling the [B] rate becomes 4 times
$\therefore$ Rate = $k[A]^0\ [B]^2$

50. Ans: 25

Sol: For a 1st order reaction,

$$\mathbf{A_0} \xrightarrow{3t_{1/2}} \frac{A_0}{8}$$

$t_{1/2}$ = 25 minutes

51. Ans: 166

Sol: Slope = $\frac{-E_a}{R} = -2 \times 10^4$

$E_a = 2 \times 10^4 \times 8.3 \times 10^{-3}$ kJ mol^{-1}

= 166

52. Ans: Gluconic acid

Sol: Glucose on oxidation with bromine water gives gluconic acid

53. Ans: independent of the pressure of the gas

Sol: $\log \frac{x}{m} = \log K + \frac{1}{n} \log P$

When $\frac{1}{n} = 0$

$\frac{x}{m}$ remains as a constant

54. Ans: gel

Sol: Cheese is a liquid dispersed in solid phase

55. Ans: 100

Sol: $\Delta T_b = K_b \times \frac{W_2}{M_2} \times \frac{1000}{W_1}$

$M_2 = \frac{2.5 \times 1.5 \times 1000}{0.75 \times 50}$

= 100 g mol^{-1}

56. Ans: Carbon disulphide – Acetone

Sol: Carbon disulphide – Acetone shows positive deviation

57. Ans: 0.555

Sol: $p_A = x_A.K_H$

$x_A = \frac{1}{10^5} = 10^{-5}$

10^{-5} moles of gas in one mole of water

No. of unites moles in 1 L water
$= 10^{-2} \times 55.5 = 0.555$

58. Ans: 1148

Sol: $W = 2.303\ nRT \log \frac{V_2}{V_1}$

$= 2.303 \times 0.2 \times 8.314 \times 300 \log \frac{25}{2.5}$

$= 1148\ J$

59. Ans: cis-platin

Sol: cis platin inhibit the growth of tumours

60. Ans: tetrammineaquachloridocobalt(III) chloride

Sol: $Co[(NH_3)_4](H_2O)Cl]Cl_2$ is named is tetrammineaquachloridocobalt(III) chloride

61. Ans: $I^- < Cl^- < F^- < H_2O < CN^-$

Sol: The correct order of ligands as per spectrochemical series is
$I^- < Cl^- < F^- < H_2O < CN^-$

62. Ans: Mn^{2+}

Sol: There are five unpaired electrons in Mn^{2+}

63. Ans: Sc

Sol: Scandium (Z = 23) does not exhibit variable oxidation state

64. Ans: Peroxy disulphate

Sol: Manganese (II) salt is oxidised to MnO_4^- in aqueous solution by peroxy disulphate

65. Ans: Addition of 5 mL of 1 M HCl

Sol: When the $[H^+]$ increases, then pH decreases. Addition of an acid of higher concentration increases the $[H^+]$

66. Ans: $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$

Sol: $2SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$
As there is a decrease in the number of moles of products, there is decrease in Entropy

67. Ans:

ΔG	ΔH	ΔS
–	–	–

Sol: ΔG = – ve
ΔH = – ve
ΔS = – ve

$\Delta G = \Delta H - T\Delta S$
Spontaneous at low temperatures

68. Ans: 180

Sol: For a zero order reaction, $t_{½} \propto [A_0]$

$t_{½} = 4 \times 45$

= 180 minutes

69. Ans: 2

Sol: Quantity of electricity
$= 3.86 \times 2500$
= 9650 C
Wt. of Ca deposited by 96500 C = 20 g
$\therefore$ Wt. deposited by 9650 C = 2 g

70. Ans: – 0.79
Sol: $Zn^{2+} + 2e^- \rightarrow Zn$

$E_{el} = E^\circ_{el} + \frac{0.06}{2} \log [Zn^{2+}]$

$= -0.76 + 0.03 \log 10^{-1}$

$= -0.79\ V$

71. Ans: Cell constant – m

Sol: Unit of cell constant $\left(\frac{\ell}{A}\right)$ is m^{-1}

72. Ans: Moist paste of NH_4Cl and $ZnCl_2$

Sol: The electrolyte used in dry cell (Leclanche cell) is a moist paste of NH_4Cl and $ZnCl_2$

73. Ans: $[M^{-1} L^3 T^{-2}]$

Sol: $[G] = (N\ m^2\ kg^{-2}]$
$= [M^{-1} L^3 T^{-2}]$

74. Ans: Parabola

Sol: $S = ut + \frac{1}{2}at^2$

$\Rightarrow$ Parabola

75. Ans: Velocity

Sol: $\tan\theta = \frac{S}{t} = v$

76. Ans: 45°

Sol: $R = \frac{u^2}{g} \sin 2\theta$

$\Rightarrow$ When $\theta = 45°$,
R is maximum

77. Ans: 5

Sol: $\bar{a} = \frac{d\bar{v}}{dt} = 5\hat{j}$

$\Rightarrow |\bar{a}| = 5 \text{ m s}^{-2}$

78. Ans: Co-efficient of kinetic friction is less than the coefficient of static friction.

Sol: $\mu_k < \mu_s$

79. Ans: 3.0

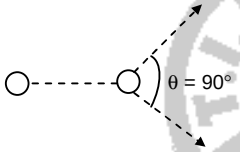
Sol: $J = \Delta p$
$= m(2u)$
$= 2mu$
$= 2 \times 0.15 \times 10 = 3 \text{ N s}$

80. Ans: $K_f - K_i$

Sol: $W = \Delta KE$
$= K_f - K_i$

81. Ans: At right angle to each other

Sol:



82. Ans: Angular momentum

Sol: $\bar{L} = \bar{r} \times \bar{p}$

$\Rightarrow |\bar{L}| = mvr$ is constant

83. Ans: $\left(1, \frac{4}{3}\right)$

Sol: $X_{CM} = \frac{3}{3} = 1 \text{ m}$

$Y_{CM} = \frac{4}{3} = \frac{4}{3} \text{ m}$

$\Rightarrow \left(1, \frac{4}{3}\right)$

84. Ans: Areas

Sol: $L = 2m\frac{dA}{dt}$

85. Ans: $\frac{R-2}{R-1}$

Sol: $g_h = g\left[1 - \frac{2}{R}\right]$

$g_d = g\left[1 - \frac{1}{R}\right]$

$\Rightarrow \frac{g_d}{g_h} = \frac{(R-2)}{(R-1)}$

86. Ans: Young's modulus of rubber is more than that of steel

Sol: Young's modulus of steel is more than that of rubber

87. Ans: 5×10^6 N

Sol: $F = A \Delta p$
$= 0.5 \times 0.5 \times \rho gh$
$= 0.5 \times 0.5 \times 10^3 \times 10 \times 2000$
$= 5 \times 10^6$ N

88. Ans: 2 cm

Sol: $h = \frac{2T\cos\theta}{r\rho g}$

$= \frac{2 \times 0.07 \times 1}{7 \times 10^{-4} \times 1000 \times 10}$

$= 0.02$ m $= 2$ cm

89. Ans: 50 cc

Sol: $V_0 \gamma_{flask} \Delta T = V_m . \gamma_{Hg} \Delta T$
$\Rightarrow V_0 = 20 V_m$
$\Rightarrow V_m = \frac{V_0}{20} = \frac{1000}{20}$
$= 50$ cc

90. Ans: $\frac{5}{2}RT$

Sol: $TE = f\frac{1}{2}RT$

$= \frac{5}{2}RT$

91. Ans: Cyclic process - $\Delta U = 0$

92. Ans: 1 m

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

$T = 2 \text{ s} \Rightarrow \ell = 1$ m

93. Ans: $\frac{3\pi}{4}$

Sol: $y_1 = 5 \sin 100t$

$y_2 = 4\cos\left(100t + \frac{\pi}{4}\right)$

$= 4\sin\left(100t + \frac{3\pi}{4}\right)$

$\Rightarrow \Delta\phi = \frac{3\pi}{4}$ rad

94. Ans: $\frac{\pi}{6}$

Sol: $\omega = 12$

$\Rightarrow T = \frac{2\pi}{\omega} = \frac{2\pi}{12}$

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

95. Ans: $f\left(1+\frac{v_s}{v}\right)$

Sol: $f_{app.} = f\frac{v}{(v - v_s)}$

$f\frac{1}{\left[1-\frac{v_s}{v}\right]}$

$= f\left[1-\frac{v_s}{v}\right]^{-1} = f\left[1+\frac{v_s}{v}\right]$

96. Ans: Directly proportional to E

Sol: $\overline{P} \propto \overline{E}$

97. Ans: $\frac{1}{r}$

Sol: $E = \frac{2\lambda}{4\pi\varepsilon_0 r}$

$\Rightarrow E \propto \frac{1}{r}$

98. Ans: Halved

Sol: $C = \frac{\varepsilon_0 A}{d}$

$C' = \frac{\varepsilon_0 A}{2d} = \frac{C}{2}$

99. Ans: V depends on I linearly

Sol: $\frac{V}{I}$ = constant

$\Rightarrow$ Ohm's law is valid

100. Ans: 50 cm

Sol: Error is minimized if balancing point is near centre (i.e. at 50 cm point)

101. Ans: 4.7 kΩ, 20%

Sol: $4.7 \times 10^3 \pm 20\%$

$\Rightarrow$ 4.7 kΩ, 20%

102. Ans: Ampere's Circuital law.

Sol: Biot-Savart's law is also known as Ampere's law.

103. Ans: $\chi_d < \chi_p < \chi_f$

Sol: $\mu_r = \chi + 1$

$\chi_d < \chi_p < \chi_f$

104. Ans: C is doubled and V remains unchanged.

Sol: $\frac{V}{I} = \frac{BNA}{C}$

$\Rightarrow N \Rightarrow 2N$, $\frac{\theta}{I}$ = doubles

$\frac{\theta}{IR} = \frac{BNA}{CR}$ remains unchanged

105. Ans: 0.5

Sol: $L = \frac{E}{\left(\frac{di}{dt}\right)} = \frac{5}{10}$

= 0.05 H

106. Ans: 1 A

Sol: $\mathcal{E} = \frac{d\phi}{dt} = 8t + 2$

At t = 1 s, $\mathcal{E} = 8 + 2$

= 10 V

$\therefore i = \frac{\mathcal{E}}{R} = \frac{10}{10} = 1$ A

107. Ans: VIcosϕ

Sol: Considering the instantaneous values as the measured values, which will be RMS values, average power = VI cosϕ

108. Ans: $3.6\hat{j}$

Sol: E = Bc

$= 1.28 \times 10^{-8} \times 3 \times 10^8$

$= 3.6$ V m^{-1}

$\overline{E} \times \overline{B}$ in the direction of $\overline{c}$

$\Rightarrow \overline{E} = 3.6\hat{j}$

109. Ans: 37.5 cm

Sol: u = –25 cm

v = –75 cm

f = ?

$-\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

$\frac{1}{25} - \frac{1}{75} = \frac{1}{f}$

$\Rightarrow$ f = +37.5 cm

110. Ans: $\frac{\lambda}{d}$

Sol: $\beta = \frac{\lambda D}{d}$

$\theta = \frac{\beta}{D} = \frac{\lambda}{d}$

111. Ans: $\tan^{-1}\left(\frac{4}{3}\right)$

Sol: $\tan\phi = \frac{4}{3}$

$\Rightarrow \phi = \tan^{-1}\left(\frac{4}{3}\right)$

112. Ans: 0.153 nm

Sol: $\lambda = \frac{12.27}{\sqrt{V}}\text{Å}$

$= \frac{12.27}{8}\text{Å}$

$= 1.533\ \text{Å}$

$= 0.1533$ nm

113. Ans: $\frac{1}{16}$

Sol: $f = \left(\frac{1}{2}\right)^{\frac{t}{T}}$

$= \left(\frac{1}{2}\right)^4 = \frac{1}{16}$

114. Ans: 26.7 MeV

Sol: Proton-proton cycle

115. Ans: Photodiode

116. Ans: AND

117. Ans: 50

Sol: $\beta = \frac{\Delta I_C}{\Delta I_B} = \frac{10^{-3}}{20\times10^{-6}}$

=50

118. Ans: Telephony

119. Ans: 2010 kHz, 1990 kHz

Sol: $f_c = 2000$ kHz

$f_s = 10$ kHz

$f_{sb_1} = 2000 + 10 = 2010$ kHz

$f_{sb_2} = 2000 - 10 = 1990$ kHz

120. Ans: (D) 54 – 72 MHz
(E) 174 – 216 MHz

Sol: VHF Low band frequency ranges 54 – 216 MHz and high band ranges 175 – 216 MHz