SOLUTIONS & ANSWERS FOR KERALA ENGINEERING ENTRANCE EXAMINATION-2012 – PAPER 1 VERSION – A1

[PHYSICS & CHEMISTRY]

1. Ans: LT^{-3}

Sol: $ct^3 = [L]$

$\Rightarrow c = \frac{[L]}{T^3} = LT^{-3}$

2. Ans: 20%

Sol: $\frac{\Delta t}{t} = \frac{0.5\ s}{2.5\ s} = \frac{1}{5}$

$\% = \frac{\Delta t}{t} = \frac{1}{5} \times 100$

= 20%

3. Ans: 4.0

Sol: $v_2^1 = \frac{4.5 + 7.5}{2} = 6\ m\ s^{-1}$

$v_1 = 3\ m\ s^{-1}$

$\frac{2}{v_{Av}} = \frac{1}{3} + \frac{1}{6}$

$\Rightarrow v_{Av} = \frac{2 \times 3 \times 6}{(3+6)}$

$= 4\ m\ s^{-1}$

4. Ans: 1 : 4

Sol: $S_1 = \frac{v^2}{2a}$

$S_2 = \frac{(2v)^2}{2a} = \frac{4v^2}{2a}$

$S_1 : S_2 = 1 : 4$

5. Ans: 1 : 3 : 5 : 7 ….

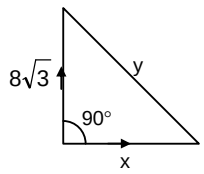
Sol: $S_1 : S_2 : S_3 = 1 : 3 : 5 : 7$ ….

6. Ans: Horizontal component of velocity.

Sol: Horizontal velocity of a projectile is conserved.

7. Ans: 2, 14

Sol:



x + y = 16

$\left(8\sqrt{3}\right)^2 + x^2 = y^2$

$\Rightarrow$ y = 14 N, x = 2 N

8. Ans: Impulse

Sol: Impulse is a vector

$\vec{j} = \Delta\vec{p}$

9. Ans: 10 m

Sol: $u_x = 1.5\ m\ s^{-1}$

$a_y = \frac{F_v}{m} = \frac{10}{10} = 1\ m\ s^{-2}$

$S_x = u_x t = 1.5 \times 4 = 6\ m$

$S_y = u_y t + \frac{1}{2} a_y t^2 = 0 + \frac{1}{2} \times 1 \times 4^2$

= 8 m

$S = \sqrt{S_x^{\ 2} + S_y^{\ 2}} = \sqrt{6^2 + 8^2} = 10\ m$

10. Ans: $5\ m\ s^{-2}$

Sol: $F = \frac{dm}{dt}.v = 2 \times 10$

= 20 N

$a = \frac{F}{m} = \frac{20}{4} = 5\ m\ s^{-2}$

11. Ans: Constant retardation

Sol: $\tan\theta = \frac{a}{g}$

θ negative $\Rightarrow$ a is retardation.

12. Ans: $2\sqrt{5}\ m\ s^{-1}$

Sol: $\Delta PE = KE$

$mg[2.5 - 1.5] = \frac{1}{2} mv^2$

$\Rightarrow v = \sqrt{2g(h_2 - h_1)}$

$= \sqrt{2 \times 10 \times (2.5 - 1.5)}$

$= 2\sqrt{5}\ m\ s^{-1}$

13. Ans: 576 mJ

Sol: $x = 4t^2 + t$

$v = 8t + 1 = \frac{dx}{dt}$

$a = 8\ m\ s^{-2}$

$F = ma = 8 \times 4 \times 10^{-3}$
$= 32$ mN

$W = \int \overline{F}.\overline{dx} = \int_0^2 32 \text{ mN}.(8t+1)dt$

$= 32 \text{ mN}\left[\frac{8t^2}{2} + t\right]^2$

$= 32 \text{ mN}[18] = 576$ mJ

14. Ans: Parabola

Sol: $KE = \frac{1}{2}mv^2$
$KE \propto v^2$
$\Rightarrow$ parabola.

15. Ans: $\frac{5v_0h}{2r^2}$

Sol: Impulse = mv_0
Angular impulse = mv_0h
$= I\omega = \frac{2}{5}mr^2\omega$
$\Rightarrow \omega = \frac{5v_0h}{2r^2}$

16. Ans: $\frac{7}{8}mgr$

Sol: $\sigma = \frac{M}{\pi r^2} = \frac{M_1}{\pi\left(\frac{r}{2}\right)^2}$

$\Rightarrow M_1 = \frac{M}{4}$

$U_1 = Mgr;\ U_2 = \frac{M}{4}g.\frac{r}{2}$

$= \frac{Mgr}{8}$

$U_1 - U_2 = \frac{7Mgr}{8}$

17. Ans: $\frac{R}{\sqrt{2}}$

Sol: $\frac{MR^2}{2} = MK^2 \Rightarrow K = \frac{R}{\sqrt{2}}$

18. Ans: $2E_0$

Sol: PE = 2TE
$= 2E_0$

19. Ans: d^{-2}

Sol: $m \propto R^3$

$\Rightarrow F \propto \frac{m^2}{d^2} \propto \frac{R^3}{d^2}$
$\propto d^{-2}$

20. Ans: The astronaut experiences no gravity.

Sol: Weightlessness in satellite.

21. Ans: Gases are least compressible

Sol: Gases are highly compressible.

22. Ans: 2 : 1

Sol: $h_1 \propto \frac{1}{r_1}$ and $h_2 \propto \frac{1}{r_2}$

$\frac{h_1}{h_2} = \frac{r_2}{r_1}$

23. Ans: 2 : 1

Sol: $\Delta p_1 = \frac{4T}{r_1}$

$\Delta p_2 = \frac{2T}{r_2}$

$\Delta p_1 = \Delta p_2$

$\frac{r_1}{r_2} = \frac{2}{1}$

24. Ans: Greater than the atmospheric pressure by ρgh

Sol: $p = p_0 + \rho gh$

25. Ans: 500 cal

Sol: $W = pdV = 10^5 \times 1680 \times 10^{-6}$
$= 168$ J
$= 40$ cal
$Q = mL = 1 \times 540$
$= 540$ cal
$\Delta U = Q - W = 540 - 40$
$= 500$ cal

26. Ans: 25 K

Sol: $R_A = \frac{t}{K_AA} = \frac{t}{K_AA}$

$R_B = \frac{t}{K_BA} = \frac{2t}{K_AA}$

$(\Delta\theta)_B = 50$ K $\Rightarrow$ Heat current

$\Rightarrow \frac{50}{\left(\frac{2t}{K_AA}\right)} = \frac{X}{\frac{t}{(K_AA)}}$

$\Rightarrow X = 25$ K

27. Ans: For cyclic process, $\Delta W = 0$

Sol: For cyclic process,
$Q = W \neq 0$

28. Ans: Becomes one-fourth

Sol: $pV = nRT$

$\Rightarrow T \propto pV$

$\Rightarrow T' = \frac{T}{4}$

29. Ans: 5

Sol: $(n + 1)T_S = nT_L$

$(n+1)\sqrt{1} = n\sqrt{1.44}$

$\Rightarrow (n + 1) = 1.2n$

$\Rightarrow n = \frac{1}{0.2} = 5$

30. Ans: $\frac{1}{2}ma^2\omega^2$

Sol: $TE = \frac{1}{2}ma^2\omega^2$ is constant.

31. Ans: Motion of oscillating liquid column in U tube.

Sol: Motion of oscillating liquid column is simple harmonic.

32. Ans: 1 : 2

Sol: $\frac{v}{4L_1} = \frac{v}{2L_2}$

$\frac{L_1}{L_2} = \frac{2}{4} = \frac{1}{2}$

33. Ans: Frequency

Sol: Frequency does not depend on medium.

34. Ans: 7

Sol: $f_b = \frac{(\omega_2 - \omega_1)}{2\pi}$

$= \frac{(454 - 410)}{2\pi}$

$= 7$ Hz

35. Ans: No correct answer

Sol: $V_1 = \frac{q_1}{4\pi\varepsilon_0 R} + \frac{q_2}{4\pi\varepsilon_0\sqrt{2}R}$

$V_2 = \frac{q_2}{4\pi\varepsilon_0 R} + \frac{q_1}{4\pi\varepsilon_0\sqrt{2}R}$

$\Delta V = V_2 - V_1 = \frac{(q_2 - q_1)}{4\pi\varepsilon_0 R} + \frac{(q_1 - q_2)}{4\pi\varepsilon_0\sqrt{2}R}$

$= \frac{(5-10)}{4\pi\varepsilon_0 R} + \frac{(10-5)}{4\pi\varepsilon_0\sqrt{2}R}$

$= \frac{5}{4\pi\varepsilon_0 R}\left[-1 + \frac{1}{\sqrt{2}}\right]$

$= \frac{5}{4\pi\varepsilon_0\left(\frac{1}{10}\right)}\left[\frac{-\sqrt{2}+1}{\sqrt{2}}\right]$

$= \frac{50}{4\pi\varepsilon_0}\left[\frac{1-\sqrt{2}}{\sqrt{2}}\right]$

$\therefore$ Work done by external agent

$= q\Delta V = \frac{50q}{4\pi\varepsilon_0}\left[\frac{1-\sqrt{2}}{\sqrt{2}}\right]$

Work done by electric field $= q(-\Delta V)$

$= \frac{50q}{4\pi\varepsilon_0}\left(\frac{\sqrt{2}-1}{\sqrt{2}}\right)$

36. Ans: 6 V m^{-1} along negative x-axis

Sol: $E_x = -\frac{\partial V}{\partial x} = -6x$

$E_y = 0$, $E_z = 0$

$\bar{E} = E_x\hat{i} + E_y\hat{j} + E_z\hat{k} = E_x\hat{i} = -6x\hat{i}$

At (1, 0, 2)

$\bar{E} = -6 \times 1\hat{i} = -6\hat{i}$

37. Ans: Polar molecules have permanent electric dipole moment.

38. Ans: $\frac{\sigma}{\varepsilon_0}$

39. Ans: 9×10^{-3} N

Sol: $\bar{r} = \hat{i} + 2\hat{j}$

$r = \sqrt{5}$ m

$F = \frac{9\times10^9 \times (3\times10^{-6})^2}{5}$

$= 16.2 \times 10^{-3}$ N

Nearest answer $= 9 \times 10^{-3}$ N

40. Ans: 180 W

Sol: $\frac{P}{3} = 20$

$\Rightarrow P = 60$ W

$\Rightarrow 3P = 60 \times 3$

$= 180$ W

41. Ans: 1 Ω

Sol: $1\text{ A} = \frac{4V}{(R_G + R + 2r)}$

$\Rightarrow R_G + R + 2r = 4$

$$0.8\text{ A} = \frac{2V}{\left(R_G + R + \frac{r}{2}\right)}$$

$$\Rightarrow R_G + R + \frac{r}{2} = \frac{2}{0.8} = 2.5$$

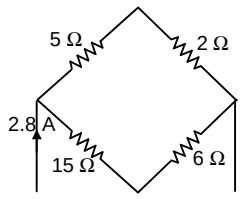
$$\Rightarrow 4 - 2r + \frac{r}{2} = 2.5$$

$\Rightarrow 1.5 = 1.5r$

$r = 1\ \Omega$

42. Ans: 2.1

Sol:



$$I_{2\,\Omega} = \frac{2.8 \times 21}{28} = 2.1\text{ A}$$

43. Ans: Relatively sensitive to temperature

44. Ans: 6.25×10^{18}

Sol: $1\text{ A} = 6.25 \times 10^{18}$ electron / s

45. Ans: $2\ \Omega$

Sol: $n = \frac{I}{I_g} = \frac{100}{4} = 25$

$$S = \frac{R_G}{(n-1)} = \frac{48}{(25-1)}$$

$= 2\ \Omega$

46. Ans: $\sqrt{\frac{4\pi M}{I}}$

Sol: $M = \pi R^2 I$

$$\Rightarrow \sqrt{\frac{M}{\pi I}} = R$$

$$L = 2\pi R = 2\pi\sqrt{\frac{M}{\pi I}}$$

$$= \sqrt{\frac{4\pi M}{I}}$$

47. Ans: $\sqrt{2}$

Sol: $T\sqrt{B}$ = constant

$$T_1 = \frac{60}{30} = 2\text{ s}$$

$$T_2 = T_1\sqrt{\frac{B_1}{B_2}} = \frac{2}{\sqrt{2}} = \sqrt{2}\text{ s}$$

48. Ans: 0

Sol: $\phi = \overline{B}.\overline{A} = BA\cos 90°$

$= 0$

49. Ans: High permeability and low retentitivty

50. Ans: 90.1%

Sol: $P_{out} = 100$ W

$P_{in} = 220 \times 0.5$

$= 110$ W

$$\eta = \frac{100}{110} \times 100 = 90.9\%$$

Nearest answer is 90.1%

51. Ans: Both P and Q decreases

Sol: Increasing flux results in decrease in current as per Lenz's law.

52. Ans: Increasing the current through it

Sol: L is independent of I.

53. Ans: 1

Sol: At resonance, power factor = 1 for LCR circuit.

54. Ans: $\frac{1}{\sqrt{\mu\varepsilon}}$

Sol: $v = \frac{1}{\sqrt{\mu\varepsilon}}$

55. Ans: Microwaves

Sol: $\upsilon_{infrared} > \upsilon_{microwaves}$

and $E = h\upsilon$

56. Ans: –20 cm

Sol: $m = \frac{f}{(f-u)}$

$m = -\frac{1}{2}$, $u = -60$ cm,

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

$\Rightarrow f = -20$ cm

57. Ans: 2β

Sol: $\beta \propto \lambda$

$\Rightarrow \beta' = 2\beta$

58. Ans: 0.800

Sol: $\frac{n_A}{n_B} = \frac{v_B}{v_A} = \frac{v_B}{1.25v_B}$

$= \frac{4}{5} = 0.8$

59. Ans: Directly proportional to numerical aperture.

Sol: (R.P of telescope) $\propto \frac{NA}{\lambda}$

60. Ans: Coherent light is always monochromatic.

Sol: Coherent light is always monochromatic.

61. Ans: $\lambda_\alpha = \lambda_p = \lambda_e$

Sol: $\lambda_B = \frac{h}{p}$;

$\Rightarrow$ p is same for all

$\Rightarrow \lambda$ same for all

62. Ans: 3 : 5

Sol: $R \propto A^{1/3}$

$\Rightarrow \frac{R_1}{R_2} = \frac{3}{5}$

63. Ans: 24

Sol: $\left(\frac{I_0}{64I_0}\right) = \left(\frac{1}{2}\right)^{\frac{t}{T}}$

$\left(\frac{1}{2}\right)^6 = \left(\frac{1}{2}\right)^{\frac{t}{T}}$

$\Rightarrow \frac{t}{T} = 6 \Rightarrow t = 6T$

= 24 h

64. Ans: One α and two β

Sol: ${}^{A}_{Z}X \xrightarrow{\alpha} {}^{A-4}_{Z-2}X \xrightarrow{2\beta} {}^{A-4}_{Z}X$

65. Ans: NAND and OR

66. Ans: Solar cell – electrical energy into light

67. Ans: Both W and V_0 decrease

68. Ans: Emitter and base

Sol: Emitter is heavily doped and base is lightly doped in comparison.

69. Ans: 5.6×10^3 km^2

Sol: $A = 2\pi Rh$

$= 2\pi \times 6.4 \times 10^3 \times 0.14$

$= 5.6 \times 10^3$ km^2

70. Ans: Sky waves

71. Ans: Curvature of Earth

Sol: Due to curvature of Earth, line-of-sight communication is limited. Antenna size is small.

72. Ans: 4 : 1

Sol: $\mu = \frac{1}{2}$

$A_{\text{side band}} = \frac{\mu Ac}{2}$

$\frac{A_{\text{side band}}}{A_c} = \frac{\mu}{2} = \frac{1}{4}$

$\Rightarrow \frac{Ac}{A_{\text{solenoid}}} = \frac{4}{1}$

73. Ans: 20

Sol: $MCO_3 \rightarrow MO + CO_2$

2g 448 cc

$\downarrow \times 50$ $\downarrow \times 50$

100 g 22400 cc

Eq. weight of the metal = $\frac{100-60}{2}$ = 20

74. Ans: $\frac{3}{4}$

Sol: $\upsilon \propto Z^2\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$\frac{\upsilon_H}{\upsilon_{Li^{2+}}} = \frac{1 \times \frac{15}{16}}{9 \times \frac{5}{36}}$

$= \frac{3}{4}$

75. Ans: H_2O

Sol: Dipole moments are

H_2O = 1.85 D

NH_3 1.47 D

$CHCl_3$ 1.04 D

CCl_4 = 0 BF_3 = 0

76. Ans: BrF_5 trigonal bipyramidal

Sol: BrF_5 has square pyramidal shape

77. Ans: CO_2

Sol: The Critical temperature of CO_2 is the highest

78. Ans: i – 5, ii – 3, iii – 1, iv – 2, v – 4

Sol: C_6H_6 diamagnetic
CrO_2 ferromagnetic
MnO antiferromagnetic
Fe_3O_4 ferrimagnetic
Fe^{3+} paramagnetic

79. Ans: Ne

Sol: The 1st I E of Ne is 2080 kJ mol^{-1} which is higher than that of C, F, Be & N

80. Ans: C–H

Sol: C–H bond length is 107 pm which is the shortest
C–N = 147 pm C–O = 143 pm
C–C = 154 pm C–F = 138 pm

81. Ans: KO_2

Sol: $2KO_2 + 2H_2O \rightarrow 2KOH + H_2O_2 + O_2$

82. Ans: Ca

Sol: Among the alkaline earth metals, Calcium has the lowest density

83. Ans: H_3BO_3

Sol: H_3BO_3 and HNO_3 are monobasic acids. H_3BO_3 is weak

84. Ans: Catenation tendency is higher in nitrogen when compared with other elements of the same group

Sol: Catenation tendency is weaker in Nitrogen compared to other group 15 elements

85. Ans: Their melting points are lower than those of pure metals

Sol: Interstitial compounds have melting points higher than that of pure metals

86. Ans: Cr_2O_3

Sol: Cr_2O_3 is amphoteric

87. Ans: $C_2H_{4(g)} + H_{2(g)} \rightarrow C_2H_{6(g)}$

Sol: $\Delta H \neq \Delta U$ when $\Delta n_g \neq 0$

88. Ans: + 48

Sol: $C_6H_{6(\ell)} + \frac{15}{2} O_{2(\ell)} \rightarrow 6CO_{2(g)} + 3H_2O_{(\ell)}$
$-3270 = 6 \times -394 + 3 \times -286 - x$
$x = +48$ kJ mol^{-1}

89. Ans: 500

Sol: $\Delta S = 2 \times 195 - (190 + 3 \times 130)$
$= -190$ J K^{-1} mol^{-1}
At equilibrium,
$T = \frac{\Delta H}{\Delta S} = \frac{-95 \times 10^3}{-190}$
$= 500$ K

90. Ans: 6

Sol: $K_c = \frac{[B]\,[C]}{[A]^2}$
$= \frac{2 \times 10^{-3} \times 10^{-3}}{(1 \times 10^{-3})^2}$
$= 6$

91. Ans: H_2SO_4 is the conjugate acid of HSO_4^-

Sol: $\underset{\text{acid}}{H_2SO_4} \rightleftharpoons H^+ + \underset{\text{base}}{HSO_4^-}$

92. Ans: 0.075

Sol: $x_{CH_3OH} = \frac{4.5}{4.5 + 55.5}$
$= 0.075$

93. Ans: 0.052

Sol: $\frac{\Delta T_b}{\Delta T_f} = \frac{K_b}{K_f}$
$\Delta T_b = \frac{0.52 \times 0.186}{1.86}$
$= 0.052$

94. Ans: 500

Sol: $\Lambda_C = \Lambda_0 \times \alpha = 8$
$\Lambda_C = \frac{1}{R} \times \frac{\ell}{A} \times \frac{1000}{N}$
$R = \frac{0.4 \times 1000}{8 \times 0.1}$
$= 500$ ohms

95. Ans: The standard EMF of the cell is – 0.27

Sol: $E^\circ_{cell} = -0.52 + 0.25$
$= -0.27$ V

96. Ans: 16

Sol: $\frac{K_{25^\circ C}}{K_{20^\circ C}} = 2$

$\frac{K_{40^\circ C}}{K_{20^\circ C}} = 2^4 = 16$ times

97. Ans: 5.0×10^{-1} mol^{-1} L s^{-1}

Sol: Rate = k.[A]^2

Rate = $\kappa = \frac{2\times10^{-14}}{0.02\times0.02}$

$= 5 \times 10^{-1}$ mol^{-1} L s^{-1}

98. Ans: colloidal antimony

Sol: Colloidal antimony is used in the treatment of Kalaazar

99. Ans: Low temperature and high pressure favour adsorption

Sol: Low temperature & high pressure favour physical adsorption

100. Ans: D-pencillamine

Sol: D-pencillamine is used in the removal of excess copper in plants and animals.

101. Ans: 0.04, 0.02

Sol: 0.02 mol $[Co\{NH_3)_5Br]Cl_2$ produce 0.04 mol AgCl & 0.02 mol $[Co(NH_3)_5Cl]SO_4$ produce 0.02 mol $BaSO_4$

102. Ans: 20%

Sol: % of S = $\frac{32\times0.699\times100}{233\times0.480}$ = 20%

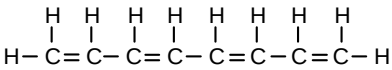
103. Ans: $\dot{C}H_3$

Sol: Order of stability of free radicals is :

$3^\circ > 2^\circ > 1^\circ > \dot{C}H_3$

104. Ans: 17 and 4

Sol:



No of σ bonds = 17

No of π bonds = 4

105. Ans: 1,3-butadiene

Sol: $H_2C{=}CH{-}CH{=}CH_2$:1,3-butadiene

106. Ans: CH_3CH_2I

Sol: Order of reactivity in S_N2 reaction : 1° alkyl halide > 2° alkyl halide

Primary alkyl iodides are more reactive than other primary alkyl halides

107. Ans: Photochemical chlorination of methane

Sol: Photochemical chlorination of methane takes place by free radical chain mechanism.

108. Ans: Achiral molecules are superimpossible

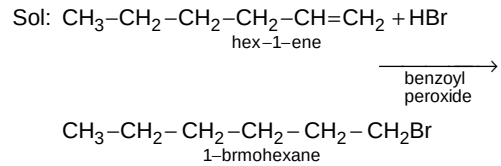
Sol: Achiral molecules are superimpossible.

109. Ans: Anomers of glucose

Sol: α and β-forms of glucose are anomers.

110. Ans: 1-bromohexane

Sol:



111. Ans: RI > RBr > RCl > RF

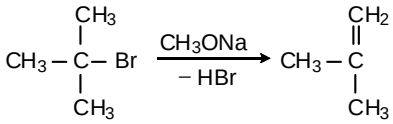
Sol: Among alkyl halides, boiling points decrease in the order : RI > RBr > RCl > RF

112. Ans: HI > HBr > HCl

Sol: The order of reactivity of hydrogen halide towards cleavage of ether linkage is HI > HBr > HCl

113. Ans: Sodium methoxide and tert-butyl bromide

Sol: tert-butylbromide undergoes elimination readily in presence of the base sodium methoxide to form 2-methylpropene



114. Ans: $C_6H_5NH_2$ < NH_3 < $C_6H_5CH_2NH_2$ < $C_2H_5NH_2$ < $(C_2H_5)_2NH$

Sol: Aliphatic 2° amine, $(C_2H_5)_2NH$, is the most basic compound among the given amines. Aniline is the least basic amine among the given compounds.

115. Ans: ethanamide, methanamine, methanol

Sol: $CH_3-COOH \xrightarrow[\Delta]{NH_3}$

$$\underset{(A)}{CH_3-CONH_2} \xrightarrow{Br_2\ /\ NaOH} \underset{(B)}{CH_3-NH_2}$$

$$\xrightarrow{NaNO_2\ /\ dil\ HCl} \underset{(C)}{CH_3OH}$$

116. Ans: cellulose

Sol: Cellulose is the constituent of cell wall of plant cells

117. Ans: Polystyrene

Sol: Polystyrene is a thermoplastic

118. Ans: ii – iv

Sol: Pencillin and ofloxacin are bactericidal antibiotic

119. Ans: 0.005

Sol: The maximum prescribed concentration of Cadmium in drinking water is 0.005 ppm

120. Ans: NO

Sol: NO reacts with O_3 to form NO_2 and O_2