

SOLUTION & ANSWER FOR COMED-2009
VERSION – B
[PHYSICS & CHEMISTRY]

1. Eddy currents are produced -----

Ans: Placed in a time varying magnetic field.

Ans: $\frac{2K_1K_2}{(K_1+K_2)}$

2. Transformer works on 220 V its efficiency is 80% -----

Ans: 45 A

Sol: Output Power = 8 kW
 Efficiency = 80%

$$\therefore \text{Input} = \frac{8}{0.8} = 10 \text{ kW} = 10000 \text{ W}$$

$$V_i = 220 \text{ V}$$

$$i_i = \frac{P_i}{V_i} = \frac{10000}{220} \approx 45 \text{ A}$$

Sol: $\frac{2}{K} = \frac{1}{K_1} + \frac{1}{K_2} \rightarrow K = \frac{2K_1K_2}{(K_1+K_2)}$

8. The square of the resultant of two equal ----

Ans: 60°

Sol: $3P^2 = P^2 + P^2 + 2P^2 \cos\theta$

$$\Rightarrow \frac{1}{2} = \cos\theta \Rightarrow \theta = \cos^{-1}\left(\frac{1}{2}\right)$$

$$= 60^\circ$$

3. Quality factor of a series LCR circuit -----

Ans: 100 Hz increase

Sol: Quality factor = $\frac{\text{Resonant frequency}}{\text{bandwidth}}$

$$3 = \frac{f_0}{b_1} \Rightarrow b_1 = \frac{f_0}{3}$$

$$2 = \frac{f_0}{b_2} \Rightarrow b_2 = \frac{f_0}{2}$$

$$\therefore \Delta b = b_2 - b_1 = \frac{f_0}{2} - \frac{f_0}{3}$$

$$= \frac{3f_0 - 2f_0}{6} = \frac{f_0}{6}$$

$$f_0 = 600 \text{ Hz}$$

$$\Delta b = \frac{600}{6} = 100 \text{ Hz increase}$$

9. With the addition of impurities -----

Ans: May increase or decrease depending on impurities.

Sol: Highly soluble impurities increase surface tension while partially soluble impurities decrease surface tension.

10. Viscosity decreases with increase in temperature -----

Ans: Both (i) and (ii) are correct.

11. Moment of momentum of an electron ----

Ans: $\frac{h}{\pi}$

Sol: $L_n = \frac{nh}{2\pi}$, $n = 2 \Rightarrow L_2 = \frac{h}{\pi}$

4. A stone dropped from the top of the -----

Ans: 80 m

Sol: $H = \frac{1}{2}gt^2$

$$= \frac{1}{2} \times 10 \times 4^2 = 80 \text{ m}$$

12. The existence of excitation and -----

Ans: Stationary orbits in an atom.

5. Liquid crystal phase which are more close

Ans: Smectic

Ans: Increases to become 2 times

Sol: $C' = \frac{\epsilon_0 A}{\left(\frac{d}{2}\right)} = 2 \frac{\epsilon_0 A}{d} = 2C$

6. if the Earth shrinks in its size (radius) mass ----

Ans: Increases

Sol: $g = \frac{GM}{R^2} \Rightarrow g \propto \frac{1}{R^2}$

14. Specific resistance of a conductor material -----

Ans: Increases with temperature

7. Two rods of same area of cross section and lengths -----

Sol: $\rho_\theta = \rho_0 [1 + \alpha \theta]$

15. Temperature coefficient of resistance of platinum -----

Ans: 45°C

$$\begin{aligned} \text{Sol: } \alpha &= \frac{R_2 - R_1}{R_1 t_2 - R_2 t_1} \Rightarrow 4 \times 10^{-3} \\ &= \frac{0.1R}{R t_2 - 20R} \\ &\Rightarrow t_2 = 25 + 20 = 45^\circ\text{C} \end{aligned}$$

16. ideal voltmeter connected as shown reads ---

Ans: 8 V

$$\begin{aligned} \text{Sol: } R_p &= \frac{12 \times 6}{(12+6)} = 4 \Omega \\ V_4 &= \frac{VR}{(R_p + R)} = \frac{16 \times 4}{(4+4)} = 8 \text{ V} \end{aligned}$$

17. When a charged particle moves perpendicular ---

Ans: Its momentum changes total energy is same

Sol: Particle moves in a circular path with constant kinetic energy. Linear momentum varies in direction.

18. A simple pendulum has a period T inside ----

Ans: Decreases

$$\text{Sol: } T' = 2\pi \sqrt{\frac{\ell}{g_{\text{eff}}}} = 2\pi \sqrt{\frac{\ell}{(g+a)}} < T = 2\pi \sqrt{\frac{\ell}{g}}$$

19. 90dB sound is 'x' times more intense than -----

Ans: 10⁵

$$\begin{aligned} \text{Sol: } I_2 &= 10^9 I_0 = x I_1 \\ I_1 &= 10^4 I_0 \\ \therefore I_2 &= 10^5 \times 10^4 I_0 \Rightarrow x = 10^5 \end{aligned}$$

20. A star is moving away from the Earth with speed -----

$$\text{Ans: } \frac{\lambda v}{c}$$

$$\text{Sol: } \frac{d\lambda}{\lambda} = \frac{v}{c} \rightarrow d\lambda = \frac{\lambda v}{c}$$

21. An open pipe emits a fundamental frequency -----

Ans: 3 nodes and 4 antinodes

Sol: For open pipe in pth harmonic,
No. of nodes = P = 3 and
No. of antinodes = P + 1 = 3 + 1 = 4

22. In an adiabatic process

Ans: There is no transfer of heat

23. Carnot's heat engine takes 300 J ----

Ans: 200 J

$$\begin{aligned} \text{Sol: } W &= Q \frac{(T_1 - T_2)}{T_1} = 300 \times \frac{(900 - 300)}{900} \\ &= 200 \text{ J} \end{aligned}$$

24. 15/16th of a radioactive sample disintegrates -----

Ans: 43 min

$$\begin{aligned} \text{Sol: } \frac{1}{16} &= \left(\frac{1}{2}\right)^{2/T} \Rightarrow \frac{2}{T} = 4 \rightarrow T = \frac{1}{2} \\ \frac{1}{\lambda} &= \frac{T}{0.6932} = \frac{0.5}{0.6932} \text{ h} \\ &= \frac{0.5}{0.6932} \times 60 \text{ min} \\ &= 43 \text{ min} \end{aligned}$$

25. Clear images of soft tissues can be well -----

Ans: MRI

26. Particles which are not composite ----

Ans: Leptons

27. Logic gate whose output will be in logic ----

Ans: NAND

Sol: A NAND gate gives low output only when all inputs are high.

28. n type and p type semiconductors can be obtained -----

Ans: Phosphorous and Indium

Sol: Pentavalent impurity for n-type and trivalent impurity for p-type.

29. In a CE amplifier $\beta = 50$ ----

Ans: 2×10^4

$$\begin{aligned} \text{Sol: } \text{Power gain} &= (\text{current gain})^2 \times \text{Resistance Gain} \\ &= \beta^2 \frac{R_L}{R_i} \\ &= 50^2 \times \frac{4000}{500} = 2500 \times 8 = 20000 \\ &= 2 \times 10^4 \end{aligned}$$

30. 0.04 m of glass contains the same number -----

Ans: $\frac{5}{3}$

Sol: $\lambda_g = \frac{0.04}{N} \text{ m}$
 $\lambda_w = \frac{0.05}{N} \text{ m}$
 $n_w = \frac{4}{3}$; $n_g = n_w \times \frac{\lambda_w}{\lambda_g}$
 $= \frac{4}{3} \times \frac{0.05}{0.05} = \frac{5}{3}$

31. Critical angle will be maximum when ----

Ans: Glass to water

Sol: $\sin C = \frac{1}{n} = \frac{2}{3}$ for glass & air
 $= \frac{8}{9}$ for glass to water
 $= \frac{3}{4}$ for water to air
 $= \frac{5}{12}$ for diamond to air

32. A ray of light incident on one face of an ----

Ans: 1.73

Sol: Prism is obviously in the least deviating position.
 $A = 60^\circ$, $D = 60^\circ$ ($\therefore i + e = A + D$)
 $n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)} \Rightarrow n = \sqrt{3} = 1.73$

33. In the spectrum of visible light produced ----

Ans: Maximum towards violet

Sol: $d = (\mu - 1) A$
 μ is maximum for violet
 \therefore Deviation is maximum for violet.

34. Convex lens of focal length f made of glass ----

Ans: Greater than f

Sol: $f_{\text{water}} = 4 f_{\text{air}}$ using $\frac{1}{f} = (n-1) \left[\frac{1}{R_1} + \frac{1}{R_2} \right]$

35. Plane polarized light is passed through an ----

Ans: 60°

Sol: $I = 0.25 I_0$ and $I = I_0 \cos^2 \theta$
 $\therefore 0.25 I_0 = I_0 \cos^2 \theta \Rightarrow$
 $\theta = \cos^{-1} \left(\frac{1}{2} \right) = 60^\circ$

36. A charge 10 nC is situated in a medium of relative ----

Ans: 90 V

Sol: $V = \frac{q}{4\pi\epsilon_0\epsilon_r r} = \frac{9 \times 10^{-9} \times 10 \times 10^{-9}}{10 \times 0.1}$
 $= 90 \text{ V}$

37. Dielectric constant of a metal ----

Ans: Infinite

38. Distance between the two point charges ----

Ans: Decreases by 31%

Sol: $F' = \frac{q_1 q_2}{4\pi\epsilon_0 (1.2d)^2}$
 $= \frac{1}{1.44} \times \frac{q_1 q_2}{4\pi\epsilon_0 d^2}$
 $= \frac{F}{1.44} = 0.69 F$

39. Potential energy of 2 charges 10 nC each ----

Ans: 10 μJ

Sol: $U = \frac{q_1 q_2}{4\pi\epsilon_0 r} = \frac{(10 \times 10^{-9})^2 \times 9 \times 10^9}{0.09}$
 $= 10^{-16} \times 10^{11}$
 $= 10^{-5} \text{ J}$
 $= 10 \mu\text{J}$

40. Three identical capacitors are first connected ---

Ans: 1 : 9

Sol: $C_S = \frac{C}{3}$; $C_P = 3 C$
 $\frac{C_S}{C_P} = \frac{1}{9}$

41. Only 2% of the main current is to be passed ---

Ans: $\frac{G}{49}$

Sol: $S = \frac{I_g R_g}{I - I_g} = \frac{2 \times G}{(100 - 2)} = \frac{G}{49}$

42. A small current carrying loop of area ---

Ans: $I = \frac{M}{A}$

Sol: $M = INA$, $N = 1$
 $\therefore I = \frac{M}{A}$

43. Two concentric circular coils, each having ----

Ans: $\left(\frac{5}{4}\right)\mu_0$

Sol: $B = \frac{\mu_0 N}{2} \left[\frac{i_1}{r_1} - \frac{i_2}{r_2} \right]$
 $= \overrightarrow{\hspace{10em}}$

44. Material of permanent magnets ---

Ans: High retentivity and high coercivity

45. Power factor of a series ----

Ans: $\frac{R}{Z}$

Sol: $\cos\phi = \frac{R}{Z}$

46. An inductor 1 H is connected ----

Ans: 1 A

Sol: $I_0 = \frac{V_0}{X_L} = \frac{220 \times \sqrt{2}}{1 \times 2\pi \times 50} = 0.99 \text{ A}$
 $\simeq 1 \text{ A}$

47. In an interference experiment intensity ratio ----

Ans: 2 : 1

Sol: $\frac{(r+1)^2}{(r-1)^2} = \frac{9}{1} \Rightarrow \frac{r+1}{r-1} = \frac{3}{1}$
 $r+1 = 3r-3 \Rightarrow 4 = 2r \Rightarrow r = 2$

48. In the Young's double slit experiment, first dark --

Ans: $\frac{d^2}{D}$

Sol: $(y_n)_D = \frac{(2n-1)\lambda D}{2d}; n = 1$
 $(y_n) = \frac{d}{2}$
 $\Rightarrow \frac{d}{2} = \frac{\lambda D}{2d} \Rightarrow \lambda = \frac{d^2}{D}$

49. Newton's ring pattern in reflected system ----

Ans: A few coloured rings with central dark spot

50. It is difficult to observe diffraction ----

Ans: Wavelength of light is small.

51. A calcite crystal is placed over a dot on a paper - ----

Ans: One dot rotating about the other stationary dot-sometimes coinciding with it.

52. Critical angle of the medium is 45° ---

Ans: 54.7°

Sol: $\sin C = \frac{1}{n} \rightarrow n = \frac{1}{\sin C} = \sqrt{2}$

$\tan\theta = n \rightarrow \theta = \tan^{-1}\sqrt{2}$
 $= 54.7^\circ$

53. Electrons are excited from $n = 1$ ----

Ans: 2

Sol: 3 - 2, 4 - 2 transitions.

54. IR region lies between

Ans: Microwaves and visible

55. Work function of a photosensitive metal is 3 eV --

Ans: 414 nm

Sol: $\lambda(\text{nm}) = \frac{1244.2}{3 \text{ eV}} = 414.7 \text{ nm}$

56. A proton and an alpha particle are subjected ---

Ans: $2\sqrt{2} : 1$

Sol: $\lambda \propto \frac{1}{mq} \Rightarrow \frac{\lambda_p}{\lambda_\alpha}$
 $= \sqrt{\frac{m_\alpha q_\alpha}{m_p q_p}} = \sqrt{\frac{4 \times 2}{1 \times 1}}$
 $= \sqrt{8} = 2\sqrt{2} : 1$

57. 'Raman shift' depends on

Ans: Molecular energy levels of the scatterer.

58. ${}_6\text{C}^{14}$ and ${}_7\text{N}^{15}$ are the ----

Ans: Isotones

Sol: No. of neutrons = 15 - 7 = 14 - 6

59. The resistance of mercury ----

Ans: Almost zero

60. Two co-axial lenses of power +4D and 1 - 2D ----

Ans: 0.5 m

Sol: $P = P_1 + P_2 = 4 - 2 = 2\text{D}$

$f = \frac{1}{P} = \frac{1}{2} = 0.5 \text{ m}$

61. $\text{CH}_3-\overset{\text{CH}_3}{\text{N}}-\text{CH}_3$, is the IUPAC name of

Ans: N, N- dimethyl methanamine

Sol : N, N- dimethyl methanamine is its IUPAC name.

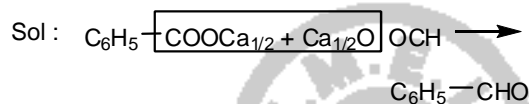
62. When Benzaldehyde is.....in presence of fused sodium acetate.....

Ans: Cinnamic acid

Sol : Cinnamic acid is formed.

63. When a mixture ofis dry distilled,.....

Ans: Benzaldehyde



64.is strongly basic?

Ans: Dimethyl amine

Sol : Dimethyl amine is an aliphatic secondary amine.

65.is bi functional compound?

Ans: Cinnamic acid

Sol: Cinnamic acid contains both C = C & COOH as functional groups.

66. When phenol is treatedpresence of AlCl_3 ,.....

Ans: mixture of o & p-cresol

Sol: -OH group is ortho para directing.

67. Pure water is neutral.....

Ans: pH = 7

Sol: for pure water pH = 7 at 298 K

68. In the titration of Mohr salt.....

Ans: KMnO_4

Sol: KMnO_4 itself act as an indicator.

69. The relationship between

Ans: $t_{1/2} \propto \frac{1}{a^{(n-1)}}$

Sol: $t_{1/2} \propto \frac{1}{a^{n-1}}$

70. 6 gm of urea isRelative lowering of.....

Ans: 0.02

Sol: Relative lowering of VP = mole fraction of solute = $\frac{0.1}{5.1} \approx 0.02$

71. 6.84 g of sucrose The molality

Ans: 0.1 M

Sol: $m = \frac{6.84 \times 1000}{342 \times 200} = 0.1$

72. When common salt is added.....based on the principle.....

Ans: Common ion effect

Sol: Salting out of soap is based on common ion effect.

73. Sucrose is a non reducing.....

Ans: 1 - 2 linkage

Sol: In glucose the linkage is between C-1 of α -glucose & C-2 of β fructose

74. Sulfur containing amino acid is

Ans: Cystein

Sol: Cystein contains sulphur

75. In the Molisch reagent,.....

Ans: α naphthol in alcohol

Sol: Molishes reagent is α -naphthol in alcohol

76. In benzene,.....

Ans: sp^2 hybridisation

- Sol: Carbon atoms in benzene are sp^2 hybridised
- 77.** When vapours of isopropyl.....
- Ans: dehydrogenation
- Sol: It is dehydrogenation.
- 78.** A reaction is spontaneous at
- Ans: ΔH is $-ve$ and ΔS is $+ve$
- Sol: When ΔH is $-ve$ & ΔS is positive
 $\Delta G = \Delta H - T\Delta S$ is negative at all temperatures
- 79.** The coordination number
- Ans: 6
- Sol: NaCl is a crystal where the coordination numbers of Na^+ & Cl^- are 6 each
- 80.** Conjugate acid.....
- Ans: NH_3
- Sol: The conjugate acid of NH_2^- is NH_3 .
- 81.** Highest molar conductivity
- Ans: 0.005 M NaCl
- Sol: Molar conductivity of a strong electrolyte increases with dilution.
- 82.** In the detection of III group.....
- Ans: decrease in the ionization of NH_4OH
- Sol: NH_4Cl decreases the ionization of NH_4OH due to common ion effect.
- 83.** Just before attaining
- Ans: Rate of forward reaction decreases & Rate of backward reaction increases.
- Sol: At equilibrium the rate of forward and backward reactions become equal. Hence just before equilibrium the rate of backward reaction increases & that of forward reaction decreases to equilibrium value
- 84.**highest magnetic moment?
- Ans: Fe^{2+}
- Sol: In Fe^{2+} there are four unpaired electrons.
- 85.** In 3d series as.....scandium to zinc the paramagnetism
- Ans: First increases to a maximum & then decreases.
- Sol: The number of unpaired electrons increases to a maximum then decreases to zero
- 86.** The number of unpaired
- Ans: 5
- Sol: In Fe^{3+} there are five unpaired electrons in the 3d level.
- 87.** The IUPAC name of $K_4[Fe(CN)_6]$
- Ans: Potassium Hexa cyano ferrate (II)
- Sol: The IUPAC name of $K_4[Fe(CN)_6]$ is potassium hexacyanoferrate (II)
- 88.** The adsorption ofincreases with
- Ans: decrease of temperature
- Sol: Adsorption is an exothermic process hence it is increased by decrease of temperature.
- 89.** Electrolysis of brine.....
- Ans: Cl_2 , H_2 , NaOH
- Sol: Electrolysis of aqueous solution of NaCl produce NaOH, H_2 & Cl_2
- 90.** The enzyme.....
- Ans: Ptyalin
- Sol: Ptyalin in saliva hydrolyses starch to maltose
- 91.**an unsaturated fatty acid?
- Ans: Linolenic acid
- Sol: Linolenic acid is an unsaturated fatty acid.

92.chlorine is passed through boiling toluene.....

Ans: Benzyl chloride

Sol: Toluene undergoes side chain chlorination.

93. The standard temperature used.....

Ans: 298K

Sol: The standard temperature considered is 25°C or 298K.

94.is an intensive property?

Ans: Density

Sol: Density does not depend on amount of substance.

95. In a first order reaction,..... The rate constant of the reaction is

Ans: 0.02303

Sol: $K = \frac{2.303}{100} \log \frac{0.1}{0.01} = 0.02303$

96.following equilibria, pressure has no effect.

Ans: $N_2 + O_2 \rightleftharpoons 2NO$

Sol: There is no change in number of gas molecules during reaction i.e, $\Delta n_{(g)} = 0$

97. In the synthesis of ammonia.....

Ans: $K_p = K_c(RT)^{-2}$

Sol: $K_p = K_c(RT)^{\Delta n}$ $\Delta n = 2 - 4 = -2$

98. Conductivity of a solution

Ans: Addition of ethanol

Sol: Addition of ethanol does not make appreciable volume change.

99. The lowering in vapour pressure.....

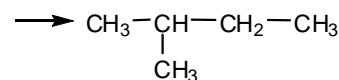
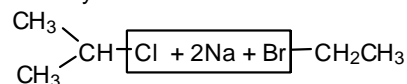
Ans: 0.1 M $K_4[Fe(CN)_6]$

Sol: $K_4[Fe(CN)_6]$ has the highest effective concentration.

100. Bromo ethane and isopropyl chloride

Ans: 2-methyl butane

Sol: 2-methyl butane is formed



101. Highest osmotic pressure

Ans: 0.1 M Aluminium sulfate

Sol: The largest number of particles are there in 0.1 M $Al_2(SO_4)_3$

102. 50% of a first order reaction is

Ans: 0.0231

Sol: $K = \frac{0.693}{t_{1/2}} = \frac{0.693}{30} = 0.0231 \text{ mn}^{-1}$

103. The ebullioscopic constant is

Ans: 1 Molal solution

Sol: K_b is the elevation in B.P produced by 1 molal solution.

104. The mass of glucose to.....

Ans: 2.7 g

Sol: $\text{Molality} = \frac{W_B}{M_B} \times \frac{1000}{W_A}$

$$0.3 = \frac{W_B}{180} \times \frac{1000}{50}$$

105. 25 ml of 0.08 N Mohr salt solution is.....

Ans: Answer is not given in the options

Sol: Mass of Mohr's salt in 500 cc solution
 $= \frac{\text{Normality} \times \text{Eq. wt}}{1000} \times 500 = \frac{0.08 \times 392}{2}$
 $= 15.68 \text{ g}$

106. When the same amount of electricity

Ans: 1.35 g

Sol: $\frac{W_1}{E_1} = \frac{W_2}{E_2}$
 $\frac{0.4}{31.75} = \frac{W_2}{108}$

107. To dry ammonia gas.....

Ans: soda lime

Sol: NH_3 is a base and it also forms ammonate with CaCl_2 .

108. The metal hydroxide which.....

Ans: $\text{Cu}(\text{OH})_2$

Sol: $\text{Cu}(\text{OH})_2$ forms $[\text{Cu}(\text{NH}_3)_4](\text{OH})_2$ a soluble complex with NH_4OH

109. Potassium dichromate can be

Ans: KOH

Sol: In alkaline medium $\text{K}_2\text{Cr}_2\text{O}_7$ is converted to K_2CrO_4 .

110. 0.5 g of an acid is neutralized by.....

Ans: 40

Sol: $40 \times 0.125\text{N NaOH} = \frac{40 \times 0.125}{1000}$
 $= 5 \times 10^{-3}$ equivalent
 5×10^{-3} equivalent NaOH = 0.5g acid
Eq. weight of acid = $\frac{0.5}{5 \times 10^{-3}} = 100$

111. 5 litres of NaOH.....

Ans: 2 g

Sol: pH = 12 contain 10^{-2} equivalent NaOH per litre i.e., 0.4 g / litre
Hence 5 litre contains 2 g NaOH

112. 50 cc of oxalic acid is oxidized.....

Ans: 3.15 g

Sol: Normality of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O} = \frac{25 \times 2}{50} = 0.1$
Eq. wt of $\text{H}_2\text{C}_2\text{O}_4 = 63$.
Wt./ litre of Oxalic acid = $63 \times 0.1 = 6.3$
Weight in 500 cc = $\frac{6.3}{2} = 3.15\text{g}$

113.....chromyl chloride is

Ans: CrO_2Cl_2

Sol: Chromyl Chloride is CrO_2Cl_2

114. Horn silver is

Ans: Halide ore

Sol: Horn Silver is the mineral having the composition AgCl

115. Tetrahedral structure

Ans: sp^3 hybridization

Sol: sp^3 hybridisation results in tetrahedral hybridization.

116. NO^+ ligand is

Ans: nitrosonium

Sol: NO^+ ligand is known as Nitrosonium

117. Cationic complex is

Ans: hexa amino platinum chloride

Sol: $[\text{Pt}(\text{NH}_3)_6]^{2+}$ is a cationic complex

118. $2p_x$ atomic orbital undergoes.....

Ans: $2p_x$ orbital

Sol: $2p_x$ undergoes linear combination with $2p_x$ orbital only.

119. Lysine is

Ans: Basic amino acid

Sol: Lysine is a basic Amino acid.

120. Schiff's reagent contains

Ans: Rosaniline

Sol: Schiff's reagent is an aqueous solution of Rosaniline, decolourised by passing SO_2 .