Section – I

1.(b)	2.(c)	3.(a)	4.(d)	5.(d)	6.(c)
7.(c)	8.(a)	9.(b)	10.(d)	11.(d)	12.(b)

13.(a) Ethyne (terminal alkyne) forms copper acetylide precipitate whereas ethane does not.

14.(a) Becuase $HCO_3^- \rightarrow CO_3^{--} + H^+$ & $HCO_3^- + H^+ \rightarrow H_2CO_3$.

Here both CO_3^{--} & H_2CO_3 are stable.

15.(b) $SO_2 + 2H_2O \rightarrow H_2SO_4 + 2[H]$

The nascent hydrogen turns colored substance to colorless compounds.

16.(c) Fluorine is most electronegative element.

$F = 1s^2 2s^2 2p^5$

17.(a) Because CaO absorbs moisture without reacting with NH_3.

18.(d) High pressure shifts rxn towards low volume.

Exothermic reaction favors low temperature.

19.(d) NaOH is commercially manufactured by electrolysis of brine.

20.(c) Because both have same molecular formula but different functional groups –COOH & ester respectively.

21.(c) $O_2 + C \rightarrow CO_2$

1 mole C $\rightarrow$ 1 mole O_2

and 1 mole at NTP = 22.4 litres

22.(b) Magnetic quantum number specifies orbital orientation.

23.(a) Molachite = $CuCO_3.Cu(OH)_2$

24.(c) $CH_3CH_2I + CH_3ONa \rightarrow CH_3OCH_2CH_3 + NaI$

Williamson's synthesis gives ether from sodium alkoxide.

25.(a) Sugar (sucrose) has molecular weight of 342 g/mol.

26.(b) Electron affinity for Halogens: Cl > F > Br > I

27.(c) $\frac{\text{Nucleon}}{\text{neutron}} = \frac{235}{235-92} = \frac{235}{143}$

28.(a) $v = \sqrt{\frac{E}{\rho}}$, ratio of elasticity & density of solid is maximum even density & elasticity is max.

29.(a) Internal energy changes only when temperature change.

30.(c) R = H

$$\text{or, } \frac{u^2\sin 2\theta}{g} = \frac{u^2\sin^2\theta}{2g}$$

$$\text{or, } 2\sin\theta.\cos\theta = \frac{\sin^2\theta}{2}$$

$$\text{or, } \tan\theta = 4$$

$$\text{or, } \theta = \tan^{-1}(4)$$

31.(a) Bob with half filled with Hg will have CG lower so period of oscillation will be more.

32.(c) $\beta = \frac{D\lambda}{d}$

$d' = \frac{d}{2}$ & D' = 2D so

$\beta' = \frac{D'\lambda}{d'} = \frac{2D\lambda}{d} \times 2 = 4\beta$

33.(c) $\frac{R'}{R} = \left(\frac{2l}{l}\right)^2 = 4$

R' = 4R

34.(a) Lose in time in a day $= \frac{1}{2} \propto \Delta\theta \times 1$ day

$= \frac{1}{2} \propto \theta \times 86400$ sec

$= 43200 \propto \theta$ sec

35.(d) $\beta = \frac{\alpha}{1-\alpha} = \frac{0.99}{1-0.99} = \frac{0.99}{0.01}$

36.(c) When switch is made on then net resistance decreases so current increases due to which brightness of X increases and current in Y decreases ie brightness decreases.

37.(c) $KE = \frac{hc}{\lambda} - \phi$

$= \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{300 \times 10^{-19} \times 1.6 \times 10^{-19}} - 2.46$

= 1.67 eV

38.(a) **First case**

$R = \sqrt{P^2 + 2PQ\cos\theta + Q^2}$ ... (i)

2nd case

$\tan 90° = \frac{2Q\sin\theta}{P + 2Q\cos\theta} = \frac{1}{0}$

$$\text{or, } P + 2Q\cos\theta = 0$$

or, $\cos\theta = -\frac{P}{2Q}$ .... (ii)

From (i) & (ii)

$$R = \sqrt{P^2 + 2PQ\left(-\frac{P}{2Q}\right) + Q^2} = Q$$

39.(c) $\frac{t_2}{t_1} = \frac{\sqrt{\frac{h}{2}} - 0}{\sqrt{h} - 0} = \frac{1}{\sqrt{2}}$

$\therefore \quad t_2 = \frac{10}{\sqrt{2}} = 7$ min

40.(d) $3f_0^c = 2f_0^0$

or, $3\frac{v}{4l_c} = 2 \times \frac{v}{2l_0}$

or, $\frac{l_c}{l_0} = \frac{3}{4}$

41.(c) $A^{-1} = \frac{1}{|A|}$ adj A; adj $A = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

42.(b) Gradient means slope.

Slope = tanθ (θ = angle with +ve x-axis)

43.(b) Any vector in 3D is represented using $\hat{i}$, $\hat{j}$ and $\hat{k}$.

44.(c) $f'(x) = \frac{d}{dx}\left(\frac{1}{x}\right) = -\frac{1}{x^2}$

45.(c) Because cos(–θ) = cosθ and cos is +ve in 1st and 4th Quadrant. i.e. 2π (turnaround)

46.(c) A function can't have multiple values at same point (x).

47.(d) Think of it as (x, y) = (x, y, 0)

i.e. $x\hat{i} + y\hat{j} = x\hat{i} + y\hat{j} + 0\hat{k}$

48.(b) Put $x = t^2$ and solve.

49.(b)

50.(b) Parabola (degree 2) has 1 turning point.

St. line (degree 1) has no turning point.

51.(c) P(5H, 0T) + P(4H, 1T) + P(3H, 2T)

$P(aH, bT) = {}^{a+b}C_a \{P(H)\}^a \times \{P(T)\}^b$

52.(b)

53.(a) Put x = 45°, tanx + cotx = 2 which is minimum among option.

54.(d) Functions are on-to-one or many to-one relations.

Each element in A has 4 possible mappings.

55.(c) $\log_x 125 = 3$

$\Rightarrow \quad 125 = x^3$

56.(c)

57.(c) $d = \left|\frac{d_1 - d_2}{\sqrt{a^2 + b^2 + c^2}}\right|$ both eqns must have same a, b & c.

58.(b)

59.(c) $f(x) = e^x$

$\Rightarrow \quad f^{-1}(x) = \log_e x$

60.(c) Standard relation.

Section – II

61.(c) 62.(b) 63.(d) 64.(a)

65.(b) $NaCl + H_2O \rightarrow Na^+ + Cl^- + H^+ + OH^-$

Reduction potential of $Na^+ < H^+$

Oxidation potential of $Cl^- > OH^-$

66.(a)

$$2HNO_3 \xrightarrow{P_2O_2} N_2O_5 + H_2O$$

P_2O_5 acts as dehydrating agent

67.(a) Reaction of haloalkane with KCN increases a carbon atom in haloalkane's product.

68.(c) $[H^+] = [H_3O^+]$

$pH = -\log[H^+]$

69.(a) Eq. base $= \frac{W}{E} \times 100$

Eq. acid $= N \times V_{m/}$

70.(d) $CaCO_3 \rightarrow CaO + CO_2$

So, 1 mole $CaCO_3$ gives 1 mole CO_2

71.(d) $NH_4Cl + NaNO_2 \rightarrow NH_4NO_2 + NaCl$

$$NH_4NO_2 \xrightarrow{\Delta} N_2 + 2H_2O$$

72.(a)

73.(c)

For 1st part

$$C' = \frac{12 \times 24}{12 + 24} = \frac{12 \times 24}{36} = 8\ \mu F$$

Across ac

$C'' = 8 + 6 + 4 = 18\ \mu F$

Across ab

$$Ceq = \frac{18 \times 9}{18 + 9} = \frac{18 \times 9}{27} = 6\ \mu F$$

74.(b) $\tan 45° = \frac{EQ}{mg}$

or, $EQ = mg$

or, $\frac{V}{d}Q = mg$

or, $Q = \frac{mgd}{V} = \frac{1.92 \times 10^{-14} \times 10 \times 5 \times 10^{-3}}{3000}$

$= 3.2 \times 10^{-19} C$

$= \frac{3.2 \times 10^{-19}}{1.6 \times 10^{-19}} e$

$= 2e$

75.(a) Change in wt = change in upthrust

or, $300 = l^2 \times 3$

or, $R^2 = 100$

or, $l = 10$ cm

76.(a) $R_{eq} = \frac{x(20 - x)}{20 - x + x}$

or, $1.8 \times 20 = 20x - x^2$

or, $x^2 - 20x + 36 = 0$

or, $x - 2x - 18x + 36 = 0$

$x = 2\Omega$ & 18Ω

Shorter is 2Ω

$\therefore$ length = 2m

77.(d) $B_P = 4B_Q$

or, $\mu_0 n_1 I_1 = 4\mu_0 n_2 I_2$

or, $\frac{I_1}{I_2} = \frac{4n_2}{n_1}$

78.(b) 5% of $p = \frac{n}{t}\frac{hc}{\lambda}$

or, $\frac{n}{t} = \frac{5}{100} \times 100 \times \frac{\lambda}{hc}$

$= \frac{5 \times 555 \times 10^{-9}}{6.62 \times 10^{-34} \times 3 \times 10^8}$

$= 13.9 \times 10^{18}$

79.(c) Energy required (E) $= 4\pi R^2 T(n^{1/3} - 1)$

$= \pi d^2 T(64^{1/3} - 1)$

$= 3\pi d^2 T$

80.(a) $0^2 = I_1 I_2 = 6 \times \frac{2}{3}$

or, $0 = 2$cm

81.(a) $E_2 - E_1 = hf$

or, $f = \frac{\{-3.4 - (-13.6)\} \times 1.6 \times 10^{-19}}{6.62 \times 10^{-34}}$

$= 2.46 \times 10^{15}$ Hz

82.(d) For glass air interface

$\sin C = \frac{1}{\mu} = \frac{1}{1.5}$

$C = \sin^{-1}\left(\frac{1}{1.5}\right) = 41.8°$

$A = r_1 + C$

or, $r_1 = 60 - 41.8 = 18.2°$

At Q, $\mu = \frac{\sin i}{\sin r_1}$

or, $i = \sin^{-1}(1.5 \times \sin 18.2) = 28°$

83.(a) $\tan\theta = \frac{F}{m(g + a)}$

or, $\tan 45° > \frac{F}{m(g + a)}$

or, $F = 2(10 + 2) = 24$N

84.(c) $T_2 V_2^{\gamma - 1} = T_1 V_1^{\gamma - 1}$

or, $T_2 = 300\left(\frac{V}{V/9}\right)^{1.4-1}$

$= 300(9)^{0.4} = 722K = 449.5°$

85.(b) $I_{max} = \frac{V}{P} = \frac{120}{15} = 8$A

$I = 80\%$ of $I_{max} = \frac{80}{100} \times 8 = 6.4$ A

Now, $V - L\frac{dI}{dt} = IR$

or, $L\frac{dI}{dt} = 120 - 6.4 \times 15$

or, $\frac{dI}{dt} = \frac{24}{0.6} = 40$ A/s

86.(b) Put n = 1, expression becomes $1 + 3^1c_1$

87.(b) Eqn of ellipse with centre (h, k) is

$\frac{(x - h)^2}{a^2} + \frac{(y - k)^2}{b^2} = 1$

Directrix is parallel to minor axis.

88.(c) Differentiate wrt x on both sides and simplify.

89.(c) Circle is: $x^2 + y^2 + 2gx + 2fy + c = 0$

Centre = $(-g, -f)$

90.(c) $\frac{dA}{dt} = \frac{d}{dt}\frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{2}a\frac{da}{dt}$

91.(b) $\int \frac{dx}{\sqrt{1-x^2}} = \sin^{-1}x$ (standard)

92.(d) By remainder theorem

$K(-2)^3 + 3(-2)^2 - 13 = 2(-2)^3 - 5(-2) + K$

93.(d) Break into 2 determinants, then simplify and lake common determinant.

i.e. adet – bdet = (a – b) det.

94.(c) Area of parallelogram = $|\vec{a} \times \vec{b}|$

95.(b) Shortest way is to solve using hit and trial method.

96.(b)

97.(d) Use calculator

98.(c) $3z_1 - 4z_2 = -6 + 11i$

$|z| = \sqrt{x^2 + y^2}$

99.(b) Put n = 2

100.(c) $x^2 = 4ay \Rightarrow a = 3$

Focus = (h, k + a) = (2, 3 – 3) = (2, 0)

...Best of Luck...