1. $\frac{E_0}{B_0} = c = \frac{\omega}{k}$

2. Power, $P = \frac{V_0 I_0}{2}\cos\frac{\pi}{2} = 0$

3. $i_3 = 3\sin\omega t + 4\cos\omega t = i_0\sin(\omega t + \theta)$

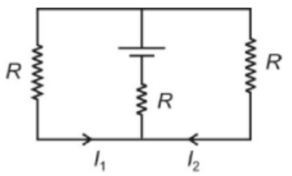
$i_0 = \sqrt{(3)^2 + (4)^2 + 2\times3\times4\cos 90^\circ} \Rightarrow i_0 = 5$

$\tan\theta = \frac{4}{3} \Rightarrow \theta = 53^\circ$; $i_3 = 5\sin(\omega t + 53^\circ)$

4. Maxwell modified the ampere's circuital law as

$\oint \vec{B}\cdot d\vec{l} = \mu_0\left(I + \varepsilon_0\frac{d\phi_E}{dt}\right)$

5. A moving conductor is equallent to a battery of emf =Blv (motion emf)



Equivalent circuit, $I = I_2 + I_1$

applying Kirchoff's law,

$I_1 R + IR - B\ell v = 0$

$I_2 R + IR - B\ell v = 0$

Adding (1) and (2)

$2IR + IR = 2B\ell v = \frac{2vB\ell}{3R}$ $\quad \therefore I_1 = I_2 = \frac{vB\ell}{3R}$

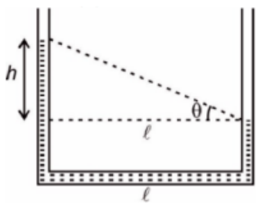
6. dc ammeter reads average value of current.

7. $a = \frac{F}{m}$; $v = u + at$; $v = \frac{Ft}{m}$

$v_P - v_Q = Bv\ell\sin 30^\circ = \frac{BFt\ell}{2m}$

8. Power factor $\cos\phi = \frac{R}{z} = \frac{80}{\sqrt{80^2 + 60^2}} = \frac{80}{100} = 0.8$

9. $B = \frac{2\sqrt{2}\mu_0 i}{\pi l}$; $A = \pi r^2$; $\phi = \frac{2\sqrt{2}\mu_0 / r^2}{l}$; $M = \frac{2\sqrt{2}\mu_0 r^2}{l}$

10. 

$\tan\theta = \frac{a}{g} \Rightarrow \frac{h}{\ell} = \frac{a}{g}$

11. $\text{Strain} = \frac{\text{Change in length}}{\text{Original length}} = \frac{\Delta\ell}{\ell} = 1$

12. $\Delta P_1 = \sqrt{3}\Delta P_2, \Delta P \propto \frac{1}{R}$; $\frac{V_1}{V_2} = \frac{R_1^3}{R_2^3} = \left(\frac{\Delta P_2}{\Delta P_1}\right)^3$

13. $W = T\Delta A \Rightarrow 3\times10^{-4} = T\times50\times10^{-4}\times2$

$T = 3.0\times10^{-2}\,N/m$

14. Air flows from smaller bubble due to high pressure

15. $U = \frac{1}{2}F\ell = \frac{1}{2}\times200\times10\times1\times10^{-3}$

16. $F = \frac{YA}{l}\Delta l \Rightarrow F = YA(\text{strain})$

F=YA (strain)

for a given strain $F_2 > F_1 \Rightarrow A_2 > A_1$

17. Deviation by a sphere is 2(i – r)

Deviation $\delta = 60^\circ = 2(i - r)$

$i - r = 30^\circ \Rightarrow r = i - 30^\circ = 60^\circ - 30^\circ = 30^\circ$

$\mu = \frac{\sin i}{\sin r} = \frac{\sin 60^\circ}{\sin 30^\circ} = \sqrt{3}$

18. $\mu \propto \frac{1}{\lambda} = \frac{1}{\sin C} \Rightarrow \sin C \propto \lambda$

Angle of incidence is such that it is equal to critical angle for green colour, i.e angle of incidence is less than critical for yellow, orange and red colour. So, they will refract into air.

19. $\text{Shift}\,\Delta x = t\left(1 - \frac{1}{\mu}\right) \Rightarrow 0.3 = t\left(1 - \frac{1}{1.6}\right) \Rightarrow t = 0.8\text{cm}$

20. The distance of other end of rod from pole of mirror.

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

Image of this end be at $v \Rightarrow \frac{1}{-3f/2} + \frac{1}{v} = \frac{1}{-f}$

$v = -3f$

$\therefore$ Image length = 3f – 2f = f

Magnification $= \frac{f}{f/2} = 2$

21. $A = \delta_m = 60^\circ \Rightarrow r = \frac{A}{2} = 30$

$i = \frac{(A + \delta_m)}{2} = 60^\circ \Rightarrow \mu = \frac{\sin 60^\circ}{\sin 30^\circ} = \sqrt{3}$

22. $R_1 = 1.5\times3 = 4.5\,\text{cm}, R_2 = 1.5\times4 = 6.0\,\text{cm}$

$R = R_1 + R_2 = 10.5\,\text{cm}$

23. Virtual object can form real image in convex mirror and plane mirror

24. Frequency is depends on source.

25. $\mu = \frac{\sin\frac{A+\delta_m}{2}}{\sin\frac{A}{2}} \therefore \delta_m = 30^\circ$

26. Shift $= \frac{\beta}{\lambda}(\mu - 1)t$

$= \frac{\beta}{5000 \times 10^{-10}} \times 0.5 \times 2 \times 10^{-6} = 2\beta$

i.e., 2 fringes upwards

27. $w = \frac{\lambda D}{d} \Rightarrow w' = \frac{\lambda 2D}{\frac{d}{2}} = \frac{4\lambda D}{d} = 4w$

28. $M = -\frac{f_0}{f_e}\left(1 + \frac{f_e}{D}\right) = -\frac{200}{5}\left[1 + \frac{5}{25}\right] \Rightarrow M = -48$

29. $I_2 = \frac{I_0}{2}\cos^2 60^\circ = \frac{I_0}{8}$

30. $y = n\frac{\lambda D}{a} = \frac{1 \times 5 \times 10^{-7} \times 2}{0.2 \times 10^{-3}} = 5 \times 10^{-3} m = 5mm$

31. $I_{dark} = \left(\sqrt{I_1} - \sqrt{I_2}\right)^2 = (6-3)^2 I_0 = 9I_0$

32. Momentum of photon, $P = \frac{E}{C}$

Velocity of photon, $C = \frac{E}{P}$

33. P -side is more negative than N -side

34. $y = \bar{A} \cdot (B + C)$

35. $\lambda = \frac{h}{\sqrt{2mk}}$; $A = \frac{200}{2^5} = 6.25g$

36. Current through resistance of 1k?

$$i = \frac{25 - 12}{1 \times 10^3} = 13mA$$

Current through $2k\Omega, i' = \frac{12}{2 \times 10^3} = 6mA$

Current through zener $= 13 - 6 = 7mA$

37. $\lambda = \frac{h}{mv} = \frac{6.6 \times 10^{-34}}{120 \times 10^{-3} \times 20} = 2.8 \times 10^{-34} m$

38. $K_{max} = hf - W$

$\frac{1}{2}mv^2 = hf - W$ is a quadratic in v, hence is a parabola, open towards f-axis v = 0 when $f = \frac{W}{h}$

39. For ideal diode forward resistance is zero. So, no current will pass through 20?.

$i = \frac{E}{R_{eff}} = \frac{2}{80} = 0.025A = 25 \times 10^{-3} A = 25mA$

40. Filter is used to reduce ripple

41. $eV = \frac{hc}{\lambda_{min}} \Rightarrow \lambda_{min} = \frac{hc}{eV}$

42. The atom is in n=5 state

43. $\alpha = \frac{237 - 209}{4} = 7$; $\beta^- = -92 + (83 + 14) = 5$

Hence x = 7, y = 5

44. $R \propto A^{\frac{1}{3}}$

46. Density $= 789 kg/m^3 = 0.789 g/cm^3$

$\therefore$ Molarity $= \frac{789}{46} = 17.15$

47.

	A	+ 2B	$\longrightarrow$ 3C
initial,	2 mole	3 moles	
final,	2 – 1.5	3 – 3	4.5 mole
	= 0.5 mol	= 0 mole	

48. No. of sulphur atoms = 0.2 × 2 × N_A = 0.4 N_A

50.
- 0.5 g CO_2 has 0.011 N_A atoms of carbon
- 0.5 g C_3O_2 has 0.022 N_A atoms of carbon
- 0.5 g $C_6H_{12}O_6$ has 0.016 N_A atoms of carbon
- 0.5 g C_5H_{10} has 0.036 N_A atoms of carbon

51. $\Delta H_c°$ is only for one mole and complete combustion.

52. $\Delta_r S^0 = \Sigma n_p S_p^0 - \Sigma n_R S_R^0$

$= [174.0 + 75] - [2 \times 195 + 213.7] = -354.7 JK^{-1} mol^{-1}$

53. $PH_3(g) \xrightarrow{\Delta H_1 = x_1} P(g) + 3H(g)$

$P_2H_4(g) \rightarrow 2P(g) + 4H(g), \Delta H_{rxn} = \Delta H(P-P) + 4\Delta H(P-H)$

$\Delta H_{rxn} = \Delta H(P-P) + 4\Delta H(P-H)$

$= x_2 + 4 \times \frac{x_1}{3} = x_2 + \frac{4x_1}{3}$

54. Standard enthalpy for formation, $\Delta_f H°$, of an element in reference state i.e. its most stable state of aggregation is taken as zero.

55. For n moles $C_p - C_v = nR$

56. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$ is the correct equation of $\Delta_f H(H_2O)$

57. Entropy is a state function

$$\Delta S = nR\ln\frac{V_2}{V_1} = 1\times R\ln\frac{3V}{V} = R\ln 3$$

58. $2Br^- + H_2O_2 \rightarrow \overset{0}{Br_2} + 2OH^-$

60. $HO-\underset{\underset{O}{\|}}{\overset{\overset{O}{\|}}{S}}-O-O-H$

x = +6

61. meq. of H_2SO_4 = meq. of metal

$$100\times 1 = \frac{0.9}{E}\times 1000$$

$E = 9$

62. $3C_2O_4^{2-} \rightarrow 6CO_2$ change in oxidation state = 6

Moles of $KMnO_4$ required = 6/5

63.

	$CH_3NH_2 + H_2O(\ell) \rightleftharpoons$	$CH_3NH_3^+(aq)$	$+\ OH^-(aq)$
Initial molar conc.	0.2	0	0
At equilibrium	$(0.2-0.2\alpha)$	$0.2\,\alpha$	$0.2\,\alpha$

$$\left[OH^-\right] = \sqrt{K_bC} = \sqrt{10^{-5}}$$

$pOH = 2.5$

$pH = 14 - 2.5 = 11.5$

64. $pH = \frac{1}{2}\left[pK_w + pk_a + \log C\right]$

$$= \frac{1}{2}\left[14 + 4.74 + \log 0.2\right] = \frac{1}{2}\left[18.74 - 0.699\right] = 9$$

65. At 1/2 end point

$\left[CH_3COOH\right] = \left[CH_3COONa\right]$

So pH = pka = 4.74

66. Mixture of weak acid and its salt with a strong base acts as an acidic buffer.

67. For $A_2B_3, K_{sp} = 108S^5$

68. $\pi = CRT$; $6.57 = \frac{4\times 1000}{M\times 100}\times 0.0821\times 300$

$$\therefore\ M = \frac{4\times 1000\times 0.0821\times 300}{100\times 6.57} = 149.9\,g$$

69. $\Delta T_f \propto i$

Higher the value of ΔT_f, lower will be the freezing point

For, Glucose, i = 1 For KBr, i = 2

For Na_2S, i = 3 For $AlCl_3$, i = 4

70. $F - 32 = \frac{9}{3}{}^\circ C$ $\therefore\ {}^\circ C = \frac{5}{9}(240-32) = 115$

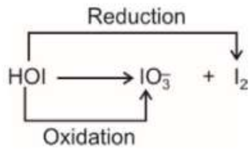
71. $M = \frac{98\times 1.8\times 10}{98} = 18$ molar ; Also, $M_1V_1 = M_2V_2$

$18\times V_1 = 0.1\times 1000$; $V_1 = \frac{0.1\times 1000}{18} = 5.55\,mL$

74. Equilibrium constant Kp_1 and Kp_2 are $\frac{P_1\alpha^2}{1-\alpha^2}$ and $\frac{4P_2\alpha^2}{1-\alpha^2}$ respectively.

$$\therefore \frac{K_{P_1}}{K_{P_2}} = \frac{P_1}{4P_2} = \frac{4}{4\times 1} = 1:1$$

76. $\Lambda_m = \frac{1000\times k}{C} = \frac{1000\times 0.0015}{0.01} = 150\,S\,cm^2\,mol^{-1}$

77. 

$E^\circ_{IO_3^-/HOI} = 1.15\,V$; $E^\circ_{HOI/I_2} = 1.43\,V$

$E^\circ_{cell} = E^\circ_{HOI/I_2} - E^\circ_{IO_3^-/HOI} = (1.43 - 1.15)V = 0.28\,V$

E°_{cell} is positive hence HOI will undergo disproportionation reaction

78. $Ph-\overset{+3}{NO_2} \rightarrow Ph-\overset{-3}{N_2}$

change in O.N. = 6

So, 6F charge is required.

79. Cathode : $Ag^+ + e^- \rightarrow Ag$

Anode : $H_2O \rightarrow \frac{1}{2}O_2 + 2H^+ + 2e^-$

Using Faraday's law

$$\text{Mole } (O_2) = \frac{0.965\times 1000}{4\times 96500} = 2.5\times 10^{-3}$$

Volume $(O_2) = 2.5\times 10^{-3}\times 22.4 = 0.056\,L$

80. $CuSO_4$ solution cannot be stored in both A and C vessel as A and C both can reduce Cu^{2+} to Cu.

81. $\Delta G^\circ = -nFE^\circ_{cell}$

$n = 2\left(H_2 \rightarrow 2H^+ + 2e\right)$

$$\therefore\ \Delta_{rxn}G^\circ = \Delta_fG^\circ(H_2O) - \Delta_fG^\circ(H_2) - \frac{1}{2}\Delta_fG^\circ(O_2)$$

$= -228.6\,kJmol^{-1}$

$-228.6\times 10^3 = -2\times 96500\times E^\circ_{cell}$

$E^\circ_{cell} = 1.18\,V$

82. Temperature distribution curve for K.E. of gas molecules.

83. Rate $\alpha[\text{ conc }]^n, 2 = (4)^{1/2} \quad \therefore n = 1/2$

84. The reaction is first order are the unit of rate constant s^{-1}

$$t = \frac{1}{K} \times 2.303 \log \frac{a}{a-x}$$

$$= \frac{1}{4.606 \times 10^{-3}} \times 2.303 \log \frac{100}{100-90}$$

$$= 0.5 \times 10^3 = 500\,s$$

85. $t_{50\%} = \frac{2.303}{k} \log 2$

$$t_{75\%} = \frac{2.303}{k} \log 4 = 2 \times \frac{2.303}{k} \log 2$$

$$\Rightarrow t_{75\%} = 2 \times t_{50\%}$$

86. Order of a reaction is determined experimentally.

87. For zero order reaction, rate remains constant.

For 80%, time = 40 min

So, for 50%, time $= \frac{40}{80} \times 50 = 25 \text{ min} = 0.416\text{hr}$

89. Henry law, is $p = K_H x$

x = mole fraction of dissolved gas

p = Partial pressure of gas

$\therefore$ $\log p = \log K_H + \log x$

$\log x = \log p - \log K_H$

90. Increase in volume decreases the pressure (T= constant), so equilibrium will shift in a direction where number of molecules of gas increases.

Answer–Key

1.	1	**2.**	4	**3.**	1	**4.**	2	**5.**	2	**6.**	4	**7.**	1	**8.**	3	**9.**	2	**10.**	4
11.	4	**12.**	1	**13.**	2	**14.**	4	**15.**	2	**16.**	2	**17.**	2	**18.**	1	**19.**	1	**20.**	4
21.	2	**22.**	4	**23.**	4	**24.**	2	**25.**	2	**26.**	1	**27.**	2	**28.**	2	**29.**	4	**30.**	4
31.	3	**32.**	1	**33.**	1	**34.**	4	**35.**	3	**36.**	3	**37.**	2	**38.**	3	**39.**	4	**40.**	2
41.	4	**42.**	3	**43.**	3	**44.**	2	**45.**	4	**46.**	1	**47.**	3	**48.**	2	**49.**	2	**50.**	4
51.	4	**52.**	1	**53.**	4	**54.**	3	**55.**	1	**56.**	2	**57.**	4	**58.**	1	**59.**	3	**60.**	4
61.	1	**62.**	3	**63.**	2	**64.**	4	**65.**	3	**66.**	1	**67.**	4	**68.**	2	**69.**	1	**70.**	4
71.	4	**72.**	1	**73.**	4	**74.**	4	**75.**	2	**76.**	2	**77.**	3	**78.**	4	**79.**	2	**80.**	2
81.	4	**82.**	3	**83.**	3	**84.**	4	**85.**	2	**86.**	3	**87.**	3	**88.**	3	**89.**	4	**90.**	2
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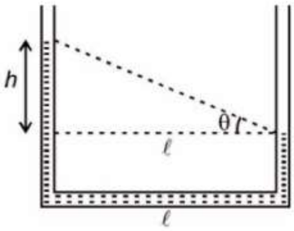
101.	4	**102.**	3	**103.**	4	**104.**	3	**105.**	4	**106.**	3	**107.**	2	**108.**	2	**109.**	4	**110.**	3
111.	4	**112.**	1	**113.**	4	**114.**	3	**115.**	2	**116.**	4	**117.**	4	**118.**	2	**119.**	4	**120.**	4
121.	4	**122.**	4	**123.**	4	**124.**	2	**125.**	2	**126.**	2	**127.**	2	**128.**	3	**129.**	3	**130.**	2
131.	2	**132.**	1	**133.**	1	**134.**	4	**135.**	2	**136**	1	**137**	1	**138**	3	**139**	4	**140**	4
141	3	**142**	4	**143**	2	**144**	1	**145**	2	**146**	2	**147**	3	**148**	1	**149**	2	**150**	2
151	4	**152**	3	**153.**	2	**154.**	3	**155.**	3	**156.**	3	**157.**	2	**158.**	4	**159.**	3	**160.**	3
161.	1	**162.**	3	**163.**	2	**164.**	1	**165.**	4	**166.**	3	**167.**	2	**168.**	3	**169.**	1	**170.**	3
171.	1	**172.**	2	**173.**	3	**174.**	4	**175.**	4	**176.**	1	**177.**	1	**178.**	3	**179.**	3	**180.**	3

1. 

; $\tan\theta = \frac{a}{g}; \frac{h}{\ell} = \frac{a}{g}$

2. $\text{Strain} = \frac{\text{Change in length}}{\text{Original length}} = \frac{\Delta\ell}{\ell} = 1$

3. $\Delta P_1 = \sqrt{3}\Delta P_2, \Delta P \propto \frac{1}{R}; \frac{V_1}{V_2} = \frac{R_1^3}{R_2^3} = \left(\frac{\Delta P_2}{\Delta P_1}\right)^3$

4. Deviation by a sphere is 2(i – r)
Deviation δ = 60° =2 (i – r)
i–r = 30°
r = i–30° = 60° – 30° = 30°
$\mu = \frac{\sin i}{\sin r} = \frac{\sin 60^\circ}{\sin 30^\circ} = \sqrt{3}$

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$i_0 = \sqrt{(3)^2 + (4)^2 + 2\times3\times4\cos 90^\circ} \Rightarrow i_0 = 5$
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$\oint \vec{B}\cdot d\vec{l} = \mu_0\left(I + \varepsilon_0 \frac{d\phi_E}{dt}\right)$

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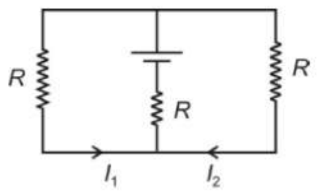

Equivalent circuit, $I = I_2 + I_1$
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$I_1R + IR - B\ell v = 0$ $I_2R + IR - B\ell v = 0$
Adding (1) and (2)
$2IR + IR = 2B\ell v = \frac{2vB\ell}{3R} \quad \therefore I_1 = I_2 = \frac{vB\ell}{3R}$

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Velocity of photon, $C = \frac{E}{P}$

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So, no current will pass through 20?.
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Hence x = 7, y = 5

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M = –48

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28. $y = n\frac{\lambda D}{a} = \frac{1\times5\times10^{-7}\times2}{0.2\times10^{-3}} = 5\times10^{-3}m = 5\,mm$

29. The distance of other end of rod from pole of mirror.
$2f - \frac{f}{2} = \frac{3f}{2}$
Image of this end be at $v \Rightarrow \frac{1}{-3f/2} + \frac{1}{v} = \frac{1}{-f}$
$v = -3f$
∴ Image length =3f-2f=f
Magnification $= \frac{f}{f/2} = 2$

30. $A = \delta_m = 60^\circ \Rightarrow r = \frac{A}{2} = 30$
$i = \frac{(A+\delta_m)}{2} = 60^\circ \Rightarrow \mu = \frac{\sin 60^\circ}{\sin 30^\circ} = \sqrt{3}$

31. $R_1 = 1.5\times3 = 4.5\,cm, R_2 = 1.5\times4 = 6.0\,cm$
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$T = 3.0\times10^{-2} N/m$

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39. $F = \frac{YA}{l}\Delta l \Rightarrow F = YA(\text{ strain })$
F=YA (strain)
for a given strain $F_2 > F_1 \Rightarrow A_2 > A_1$

40. dc ammeter reads average value of current.

41. $a = \frac{F}{m} \Rightarrow v = u + at$
$v = \frac{Ft}{m} \Rightarrow v_P - v_Q = Bv\ell\sin30^\circ = \frac{BFt\ell}{2m}$

42. Power factor $\cos\phi = \frac{R}{z}$
$= \frac{80}{\sqrt{80^2+60^2}} = \frac{80}{100} = 0.8$

43. $B = \frac{2\sqrt{2}\mu_0 i}{\pi l} \Rightarrow A = \pi r^2$
$\phi = \frac{2\sqrt{2}\mu_0 / r^2}{l} \Rightarrow M = \frac{2\sqrt{2}\mu_0 r^2}{l}$

44. $\frac{E_0}{B_0} = c = \frac{\omega}{k}$

45. Power, $P = \frac{V_0 I_0}{2}\cos\frac{\pi}{2} = 0$

46. $PH_3(g) \xrightarrow{\Delta H_1 = x_1} P(g) + 3H(g)$
$P_2H_4(g) \rightarrow 2P(g) + 4H(g), \Delta H_{rxn} = \Delta H(P-P) + 4\Delta H(P-H)$
$\Delta H_{rxn} = \Delta H(P-P) + 4\Delta H(P-H)$
$= x_2 + 4\times\frac{x_1}{3} = x_2 + \frac{4x_1}{3}$

47. Standard enthalpy for formation, $\Delta_f H°$, of an element in reference state i.e. its most stable state of aggregation is taken as zero.

48. For n moles $C_p - C_V = nR$

49.

	$CH_3NH_2 + H_2O(\ell) \rightleftharpoons$	$CH_3NH_3^+(aq)$ +	$OH^-(aq)$
Initial molar conc.	0.2	0	0
At equilibrium	$(0.2-0.2\alpha)$	$0.2\,\alpha$	$0.2\,\alpha$

$[OH^-] = \sqrt{K_bC} = \sqrt{10^{-5}}$
$pOH = 2.5 \Rightarrow pH = 14 - 2.5 = 11.5$

50. $pH = \frac{1}{2}[pK_w + pk_a + \log C]$
$= \frac{1}{2}[14 + 4.74 + \log 0.2] = \frac{1}{2}[18.74 - 0.699] = 9$

51. At 1/2 end point
$[CH_3COOH] = [CH_3COONa]$
So pH = pka = 4.74

52. $F - 32 = \frac{9}{3}°C$ ∴ $°C = \frac{5}{9}(240-32) = 115$

53. $M = \frac{98 \times 1.8 \times 10}{98} = 18$ molar

Also, $M_1 V_1 = M_2 V_2$

$18 \times V_1 = 0.1 \times 1000 \Rightarrow V_1 = \frac{0.1 \times 1000}{18} = 5.55\,mL$

56. $CuSO_4$ solution cannot be stored in both A and C vessel as A and C both can reduce Cu^{2+} to Cu.

57. $\Delta G^\circ = -nFE^\circ_{cell}$

$n = 2\left(H_2 \rightarrow 2H^+ + 2e\right)$

$\therefore \quad \Delta_{rxn} G^\circ = \Delta_f G^\circ (H_2O) - \Delta_f G^\circ (H_2) - \frac{1}{2}\Delta_f G^\circ (O_2)$

$= -228.6\,kJmol^{-1}$

$-228.6 \times 10^3 = -2 \times 96500 \times E^\circ_{cell}$

$E^\circ_{cell} = 1.18\,V$

58. Temperature distribution curve for K.E. of gas molecules.

59. Order of a reaction is determined experimentally.

60. For zero order reaction, rate remains constant.

For 80%, time = 40 min

So, for 50%, time $= \frac{40}{80} \times 50 = 25$ min $= 0.416$hr

62. Rate $\alpha [\text{ conc }]^n, 2 = (4)^{1/2} \quad \therefore n = 1/2$

63. The reaction is first order are the unit of rate constant s^{-1}

$t = \frac{1}{K} \times 2.303 \log \frac{a}{a-x}$

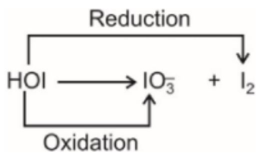
$= \frac{1}{4.606 \times 10^{-3}} \times 2.303 \log \frac{100}{100-90}$

$= 0.5 \times 10^3 = 500\,s$

64. $t_{50\%} = \frac{2.303}{k} \log 2$

$t_{75\%} = \frac{2.303}{k} \log 4 = 2 \times \frac{2.303}{k} \log 2$

$\Rightarrow t_{75\%} = 2 \times t_{50\%}$

65. 

$E^\circ_{IO_3^-/HOI} = 1.15\,V$; $E^\circ_{HOI/I_2} = 1.43\,V$

$E^\circ_{cell} = E^\circ_{HOI/I_2} - E^\circ_{IO_3^-/HOI} = (1.43 - 1.15)V = 0.28\,V$

E°_{cell} is positive hence HOI will undergo disproportionation reaction

66. $Ph-\overset{+3}{NO_2} \rightarrow Ph-\overset{-3}{N_2}$

change in O.N. = 6

So, 6F charge is required.

67. Cathode : $Ag^+ + e^- \rightarrow Ag$

Anode : $H_2O \rightarrow \frac{1}{2}O_2 + 2H^+ + 2e^-$

Using Faraday's law

Mole $(O_2) = \frac{0.965 \times 1000}{4 \times 96500}$

$= 2.5 \times 10^{-3}$

Volume $(O_2) = 2.5 \times 10^{-3} \times 22.4 = 0.056\,L$

68. Mixture of weak acid and its salt with a strong base acts as an acidic buffer.

69. For $A_2B_3, K_{sp} = 108\,S^5$

70. $\pi = CRT$

$6.57 = \frac{4 \times 1000}{M \times 100} \times 0.0821 \times 300$

$\therefore \quad M = \frac{4 \times 1000 \times 0.0821 \times 300}{100 \times 6.57} = 149.9\,g$

71. Entropy is a state function

$\Delta S = nR\ln\frac{V_2}{V_1} = 1 \times R\ln\frac{3V}{V} = R\ln 3$

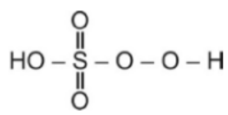
72. $2Br^- + H_2O_2 \rightarrow \overset{0}{Br_2} + 2OH^-$

74.
- 0.5 g CO_2 has 0.011 N_A atoms of carbon
- 0.5 g C_3O_2 has 0.022 N_A atoms of carbon
- 0.5 g $C_6H_{12}O_6$ has 0.016 N_A atoms of carbon
- 0.5 g C_5H_{10} has 0.036 N_A atoms of carbon

75. ΔH_c° is only for one mole and complete combustion.

76. $\Delta_r S^0 = \Sigma n_p S_p^0 - \Sigma n_R S_R^0$

$= [174.0 + 75] - [2 \times 195 + 213.7] = -354.7\,JK^{-1}mol^{-1}$

77. 

x = +6

78. meq. of H_2SO_4 = meq. of metal

$100 \times 1 = \frac{0.9}{E} \times 1000 \Rightarrow E = 9$

79. $3C_2O_4^{2-} \rightarrow 6CO_2$ change in oxidation state = 6
Moles of $KMnO_4$ required = 6/5

80. Henry law, is $p = K_H x$
x = mole fraction of dissolved gas
p = Partial pressure of gas
$\therefore$ log p = log K_H + log x
log x = log p – log K_H

81. Increase in volume decreases the pressure (T= constant), so equilibrium will shift in a direction where number of molecules of gas increases.

82. Equilibrium constant Kp_1 and Kp_2 are $\frac{P_1\alpha^2}{1-\alpha^2}$ and $\frac{4P_2\alpha^2}{1-\alpha^2}$ respectively. $\therefore \frac{K_{P_1}}{K_{P_2}} = \frac{P_1}{4P_2} = \frac{4}{4\times1} = 1:1$

84. $\Lambda_m = \frac{1000\times k}{C} = \frac{1000\times0.0015}{0.01}$
$= 150\,S\,cm^2\,mol^{-1}$

85. $\Delta T_f \propto i$
Higher the value of ΔT_f, lower will be the freezing point
For, Glucose, i = 1 For KBr, i = 2
For Na_2S, i = 3 For $AlCl_3$, i = 4

86. $H_2 + \frac{1}{2}O_2 \rightarrow H_2O$ is the correct equation of $\Delta_fH(H_2O)$

87. Density $= 789\,kg/m^3 = 0.789\,g/cm^3$
$\therefore$ Molarity $= \frac{789}{46} = 17.15$

88.

	A	+ 2B	⟶ 3C
initial,	2 mole	3 moles	
final,	2 – 1.5	3 – 3	4.5 mole
	= 0.5 mol	= 0 mole	

89. No. of sulphur atoms = 0.2 × 2 × N_A = 0.4 N_A

Answer–Key

1.	4	**2.**	4	**3.**	1	**4.**	2	**5.**	1	**6.**	1	**7.**	1	**8.**	2	**9.**	2	**10.**	2
11.	2	**12.**	1	**13.**	3	**14.**	1	**15.**	1	**16.**	3	**17.**	4	**18.**	2	**19.**	3	**20.**	3
21.	2	**22.**	4	**23.**	3	**24.**	3	**25.**	2	**26.**	2	**27.**	4	**28.**	4	**29.**	4	**30.**	2
31.	4	**32.**	4	**33.**	4	**34.**	2	**35.**	4	**36.**	2	**37.**	4	**38.**	2	**39.**	2	**40.**	4
41.	1	**42.**	3	**43.**	2	**44.**	1	**45.**	4	**46.**	4	**47.**	3	**48.**	1	**49.**	2	**50.**	4
51.	3	**52.**	4	**53.**	4	**54.**	1	**55.**	4	**56.**	2	**57.**	4	**58.**	3	**59.**	3	**60.**	3
61.	3	**62.**	3	**63.**	4	**64.**	2	**65.**	3	**66.**	4	**67.**	2	**68.**	1	**69.**	4	**70.**	2
71.	4	**72.**	1	**73.**	3	**74.**	4	**75.**	4	**76.**	1	**77.**	4	**78.**	1	**79.**	3	**80.**	4
81.	2	**82.**	4	**83.**	2	**84.**	2	**85.**	1	**86.**	2	**87.**	1	**88.**	3	**89.**	2	**90.**	2
91.	3	**92.**	4	**93.**	3	**94.**	3	**95.**	2	**96.**	2	**97.**	1	**98.**	4	**99.**	3	**100.**	2
101.	4	**102.**	4	**103.**	2	**104.**	3	**105.**	3	**106.**	1	**107.**	4	**108.**	2	**109.**	1	**110.**	2
111.	1	**112.**	3	**113.**	3	**114.**	4	**115.**	2	**116.**	2	**117.**	2	**118.**	2	**119.**	2	**120.**	1
121.	4	**122.**	4	**123.**	4	**124.**	2	**125.**	4	**126.**	4	**127.**	4	**128.**	3	**129.**	4	**130.**	4
131.	3	**132.**	4	**133.**	2	**134.**	2	**135.**	4	**136.**	2	**137.**	3	**138.**	1	**139.**	3	**140.**	3
141.	2	**142.**	1	**143.**	4	**144.**	3	**145.**	3	**146.**	4	**147.**	4	**148.**	4	**149.**	4	**150.**	3
151.	3	**152.**	2	**153.**	3	**154.**	1	**155.**	3	**156.**	2	**157.**	3	**158.**	1	**159.**	2	**160.**	3
161.	3	**162.**	3	**163.**	1	**164.**	1	**165.**	2	**166.**	3	**167.**	1	**168.**	4	**169.**	3	**170.**	3
171.	2	**172.**	2	**173.**	4	**174.**	4	**175.**	2	**176.**	1	**177.**	2	**178.**	1	**179.**	1	**180.**	3