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

1. Ans (2)

Given = $R = \frac{\rho \ell}{\pi r^2}$, then

$\frac{\Delta R}{R} \times 100$

$= \frac{\Delta R}{R} \times 100 + \frac{\Delta \ell}{\ell} \times 100 + 2\frac{\Delta r}{r} \times 100$

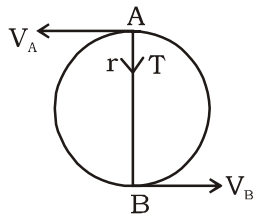
= 1% + 2% + 2 × 3% =9%

2. Ans (4)
The difference in velocities is increasing with time as both of them have more constant but different acceleration

3. Ans (3)
Heat required to boil water = mcDθ
$= 2 \times 4200 \times (100 - 20)$
$= 6.72 \times 10^3 J$
If t be the time of boil then
$\eta \times 500 \times t = 6.72 \times 10^3$

or $t = \frac{6.72 \times 10^3}{0.8 \times 500} = 28$ minutes

4. Ans (1)
Let velocity at A = v_A and velocity at B= v_B



Applying conservation of energy at A & B

$\frac{1}{2}mv_A^2 + 2gmr = \frac{1}{2}mv_B^2$

$v_B^2 = v_A^2 + 4gr$ ..... (i)

Now as it is moving in circular path it has centripetal force.

At point $A \Rightarrow T + mg = \frac{mv_A^2}{r}$

for minimum velocity $T \geq 0$

or $\frac{mv_A^2}{r} \geq mg \Rightarrow v_A^2 \geq gr \Rightarrow v_A \geq \sqrt{gr}$

5. Ans (3)

6. Ans (4)
For nuclear distintegration

$$\lambda = \frac{2.303}{t}\log\frac{N_0}{N_0 - N}$$

$$= \frac{2.303}{24\times60\times60}\log\frac{100}{82} = 2.1\times10^{-6}\ \text{scc}^{-1}$$

7. Ans (2)
γ rays has lowest wavelength and highest frequency among them while ultraviolet ray has highest wave length and lowerst frequency.
Order of frequency : b > a > c
8. Ans (2)
A galvanometer can be changed into an ammeter by the use of low resistance in parallel. So that ammeter does not draw much current which may change the magnitude of main current.
9. Ans (2)
Acceleration vector is always radial (i.e. towards the centre) for uniform circular motion
10. Ans (3)
T_1 = 27°C = 300 K

$V_1 = V$ and $V_2 = \frac{8V}{27}$

Ratio of specific heats for monoatomic gas

$$\gamma = \frac{5}{3}$$

In an adiabatic process,

$$T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}$$

or $$T_2 = \left(\frac{V_1}{V_2}\right)^{\gamma-1}\times T_1$$

$$T_2 = 300\times\left(\frac{1}{8/27}\right)^{(5/3)-1}$$

$$= 300\times\left(\frac{27}{8}\right)^{\frac{2}{3}} = 300\times\left(\frac{9}{4}\right) = 675K$$

=402°C
Hence, rise in temperature
$= T_2 - T_1$=402 – 27 = 375°C
11. Ans (1)
12. Ans (3)

$$E \propto z^2$$

$$\frac{E}{E_n} = \frac{4}{1} \Rightarrow E = 4E_n$$

13. Ans (3)
Conserving Linear Momentum

$$2Mv_c = 2Mv - Mv \Rightarrow v_c = v/2$$

14. Ans (3)

$$\frac{R_s}{R_\alpha} = \left(\frac{A_s}{A_\alpha}\right)^{1/3} = \left(\frac{32}{4}\right)^{1/3} = 2$$

15. Ans (4)

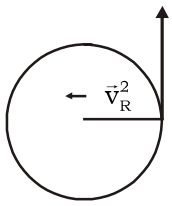
$$\frac{dH}{dt} \propto (\theta_2 - \theta_1) = (\Delta\theta)^n \Rightarrow n = 1$$

16. Ans (4)
Use a = μg and $v^2 = u^2 + 2as$
17. Ans (3)
18. Ans (4)
The charge q, which is kept at the centre of metallic spherical shell transfered to the outer surface of shell & inside the shell the electric field in zero & hence force is also zero
19. Ans (3)

$$F_n = q\left(\vec{v}\times\vec{B}\right)$$

qvB sinθ = 0 (because θ = 0°)
20. Ans (1)
21. Ans (1)
In uniform circular motion speed is consant. So, no tangential acceleration
It has only radial acceleration

$$a_R = \frac{v^2}{R}$$ [directed towards centre]



and its velocity is always in tangential direction. So these two are perpendicular to each other.
22. Ans (1)

$$e = \frac{LdI}{dt} = \frac{40\times10^{-3}(11-1)}{4\times10^{-3}} = 100V$$

23. Ans (3)

$$C_s = \frac{C_1C_2}{C_1 + C_2} = 3$$

$$C_p = C_1 + C_2 = 16 \ \therefore\ C_1C_2 = 48$$

$$C_1 - C_2 = \sqrt{(C_1 + C_2)^2 - 4C_1C_2}$$

$$= \sqrt{16^2 - 4\times48} = \sqrt{64} = 8$$

$\therefore$ C_1 = 12 μF and C_2 = 4μF
24. Ans (4)
At the centre of the earth gravity is zero
25. Ans (2)
Frequency does not depend upon the medium, so, it will remain same in the matrial of the tuning fork and in air.
26. Ans (1)
27. Ans (4)

28. Ans (3)
If F force acts for short interval Δt, then
$\vec{F}\Delta T = m\Delta\vec{v}$

29. Ans (2)
For electromagnetic wave,
$F_E = F_M \Rightarrow eE = BeC \Rightarrow E = B.C$
$= 2 \times 10^{-7} \times 3 \times 10^8 = 60$ V/m

30. Ans (1)
According to Biot Savart's law
$$dB = \frac{\mu_0}{4\pi}.\frac{Id\ell\sin\theta}{r^2}$$
$$dB \propto \frac{1}{r^2}$$
So, graph (1) is correct

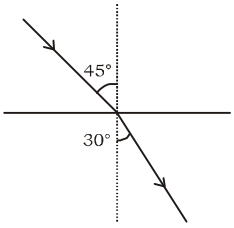
31. Ans (2)
32. Ans (3)
33. Ans (3)
34. Ans (1)
35. Ans (3)
$$Y = \frac{F/A}{\Delta\ell/\ell} = \frac{\frac{250\times9.8}{50\times10^{-6}}}{\frac{0.5\times10^{-3}}{2}}$$
$$= \frac{250\times9.8}{50\times10^{-6}} \times \frac{2}{0.5\times10^{-3}}$$
$$\Rightarrow 19.6\times10^{10}\,N/m^2$$

36. Ans (3)
Max. force = mass × max. acceleration
$= m4\pi^2v^2a = 1\times4\times\pi^2\times(60)^2\times0.02$
$= 288\,\pi^2$

37. Ans (2)
Changing electric field gives rise to displacement current which creates magnetic field around it.

38. Ans (4)

39. Ans (3)



Refractive index $\mu = \frac{\sin 45^\circ}{\sin 30^\circ}$
$$\mu = \frac{1}{\sqrt{2}} \times 2 = \sqrt{2}$$
Now, $\mu = \frac{\text{velocity of light in air}}{\text{velocity of light in medium}} = \sqrt{2}$
Velocity of light in medium
$$= 3\times10^8 \times \frac{1}{\sqrt{2}} = 2.12\times10^8\,m/sec$$

40. Ans (3)
Rain drops are in spherical shape due to surface tension.

41. Ans (4)
$\delta_1 = 40^\circ, \delta_2 = 30^\circ, \delta = ?$
$$\cot\delta = \sqrt{\cot^2\delta_1 + \cot^2\delta_2}$$
$$= \sqrt{\cot^2 40^\circ + \cot^2 30^\circ}$$
$$\cot\delta = \sqrt{1.19^2 + 3} = 2.1$$
$\therefore \delta = 25^\circ$ i.e. $\delta < 40^\circ$

42. Ans (3)
43. Ans (2)
44. Ans (4)
45. Ans (2)
46. Ans (2)
$\because$ 180 gm glucose has = N_A molecules
$\therefore$ 5.23 gm glucose has = $\frac{5.23\times6.023\times10^{23}}{180}$
$= 1.75 \times 10^{22}$ molecules

47. Ans (2)
For Lyman series, $n_1 = 1$
For shortest wavelength of Lyman series the energy difference in two levels showing transition should
$$\frac{1}{\lambda} = R_H\left[\frac{1}{1^2} - \frac{1}{\infty^2}\right] = 109678$$
$\therefore \lambda = 911.7 \times 10^{-8} = 911.7$ Å

48. Ans (3)
Here, $h = 6.62 \times 10^{-27}$ erg
$E_3 = -2.41 \times 10^{-12}$ erg
$E_2 = -5.42 \times 10^{-12}$ erg
$\Delta E = E_3 - E_2 = -2.41 \times 10^{-12} + 5.42 \times 10^{-12}$
Now, we know that, $\Delta E = h\nu$
$$\nu = \frac{\Delta E}{h} = \frac{3.01\times10^{-12}}{6.62\times10^{-27}}$$
Since $\nu = \frac{c}{\lambda}; \lambda = \frac{c}{\nu}$
$$\therefore \lambda = \frac{6.62\times10^{-27}\times3\times10^8}{3.01\times10^{-12}}$$
$\lambda = 6.6\times10^{-5}$ cm
Since, 1Å = 10^{-8} cm
$\lambda = 6.6 \times 10^3$ Å

49. Ans (2)
The jump in IP value exists in IP_5 and thus removal of fifth electron occurs from inner shell. Thus element contains four electrons in its valency shell.

50. Ans (3)
$SnCl_2$ is a bent shape molecule due to presence of lone pair of electrons.
51. Ans (1)
Due to presence of lone pair of electrons.
XeF_4 – Square planar
XeF_2 – Linear
XeF_6 – Pentagonal pyramidal
52. Ans (1)
53. Ans (1)
Partial Pressure = Mole fraction × Total pressure
= Vol. fraction × Total pressure

$\therefore P_{O_2} = 0.2 \times 760 = 152$ mm

$\therefore P_{N_2} = 0.8 \times 760 = 608$ mm

54. Ans (1)
$I_{2(solid)} \rightarrow I_{2(vapour)}; \Delta H = 24$ Cal/g at 200°C
$\Delta C_P = C_P$ of product – C_p of reactant
$\Delta C_p = 0.031 - 0.055 = -0.024$ Cal/g
$\Delta s\Delta H_2 - \Delta H_1 = \Delta C_P(T_2 - T_1)$
$\therefore \Delta H_2 - 24 = -0.024(523 - 473)$
$\therefore \Delta H_2 = 22.8$ Cal/g
55. Ans (2)
The combustion reaction of napthalene.
$C_{10}H_8(5) + 12O_{2(g)} \rightarrow 10CO_{2(g)} + 4H_2O_{(1)}$;
$\Delta E = -5133$ kJ
$\Delta n = 10 - 12 = -2$ mol
Now applying the relation
$\Delta H = \Delta E + (Dn)_g RT$
$= -5133 \times 10^3 + (-2)(8.314)(298)$
$= -5133000 J - 4955.14 J$
$= -5137955.14$ Joule
56. Ans (3)

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

At equilibrium (1–x) (3–3x) 2x
(x = 0.0025)

Active massess $\frac{(1-0.0025)}{4}\ \frac{(3-0.0075)}{4}\ \frac{0.0050}{4}$

Applying low of mass action,

$$K_C = \frac{[NII_3]^2}{[N_2][H_2]^3} = \frac{\left(\frac{0.0050}{4}\right)^2}{\left(\frac{9.9975}{4}\right)\left(\frac{2.9925}{4}\right)^3}$$

$= 1.49 \times 10^{-5}\ L^2\ mol^{-2}$
K for the reaction,

$$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \rightleftharpoons NH_3(g)$$

is equal to $\sqrt{K_C}$,

i.e. $K = \sqrt{K_C} = \sqrt{1.49 \times 10^{-5}} = 3.86 \times 10^{-3}$ L mol^{-1}

57. Ans (3)
Concentration of pyridinium chloride
= 0.15 × 2 = 0.3 M

$$pOH = \log\frac{[Salt]}{[Base]} - \log K_b$$

$$= \log\frac{0.3}{0.2} - \log 1.5 \times 10^{-9} = 9$$

$[OH^-] = 10^{-pOH} = 10^{-9}$
pH = (14 – pOH) = (14–9)=5
58. Ans (3)
Solubility in moles per dm^3

$$= \frac{15.6 \times 10^3}{78 g/mole} = 2.0 \times 10^{-4}$$

$\because CaF_2 \rightleftharpoons Ca^{2+} + 2F^-$
$\therefore [Ca^{2+}] = 2.0 \times 10^{-4}$
and $[F^-] = 2 \times 2.0 \times 10^{-4}$
Hence, solubility product K_{sp}
$= [Ca^{2+}][F^{-2}]$
$= [2.0 \times 10^{-4}][4.0 \times 10^{-4}]$
$= 32 \times 10^{-12}$
59. Ans (4)

Equivalent weight of $S_2O_3^{2-} = \frac{2M}{2} = M$

60. Ans (2)
61. Ans (1)
62. Ans (2)
63. Ans (1)
Electromeric effect comes into play at the demand of attacking reagent
64. Ans (3)
n – Propyl bromide
65. Ans (3)
This reaction occurs according to Markownikoff's rule which states that when an unsymmetrical alkene undergo hydrohalogenation, the negative part goes to that C – atom which contain lesser no. of H – atom.

$$CH_3 - CH_2 - C \equiv CH + HCl \rightarrow CH_3-CH_2-\underset{Cl}{\underset{|}{C}} = CH_2$$

$$\xrightarrow{HI} CH_3 - CH_2 - \underset{Cl}{\overset{I}{\underset{|}{\overset{|}{C}}}} - CH_2$$

66. Ans (3)
67. Ans (3)

$$Z = \frac{V \times N_A \times d}{M}$$

$$= \frac{4.2 \times 8.6 \times 8.3 \times 10^{-24} \times 6.023 \times 10^{23} \times 3.3}{155} = 3.84 = 4$$

68. Ans (2)

In a unit cell, atoms (W) at the corner $\frac{1}{8} \times 8 = 1$

atoms (O) at the centre of edges $= \frac{1}{4} \times 12 = 3$

atoms (Na) at the centre of the cube = 1

W : O : Na = 1 : 3 : 1, hence formula = $NaWO_3$

69. Ans (2)
$BaCl_2$ gives maximum (3) ions hence it shows heighest elevation in boiling point

70. Ans (2)
$\Delta T_b = imK_b = 2 \times 1 \times 0.52 = 1.04$
$\therefore T_{B\backslash b} = 100 + 1.04 = 101.04°C$

71. Ans (1)
More negative is the reduction potential, higher will be the reducing property,.i.e. the power to give up electrons.

72. Ans(4)
Reducing power i.e. the tendency to lose electrons increases as the reduction potential decreases

73. Ans (1)
Increase in concetration of B = 5×10^{-3} mol L^{-1}
Time = 10 sec
Rate of appearence of B

$$= \frac{\text{Increase in concentration of B}}{\text{Time taken}}$$

$$= \frac{5 \times 10^{-3} \text{molL}^{-1}}{10 \text{sec}} = 5 \times 10^{-4} \text{ molL}^{-1}\text{Sec}^{-1}$$

74. Ans (1)
It is due to adsorption of S^{2-} ions on the surface of the colloidal particles present in a colloidal sol.

75. Ans (2)

76. Ans (3)
$HO - SO_2 - OH + PCl_5 \rightarrow Cl - SO_2 - OH + POCl_3 + HCl$
$HO - SO_2 - OH + 2PCl_5 \rightarrow Cl - SO_2 - Cl + 2POCl_3 + 2HCl$
Sulphuryl chloride

77. Ans (4)

$I_2 + NaF \longrightarrow$
$I_2 + NaBr \longrightarrow$ } No reaction
$I_2 + NaCl \longrightarrow$

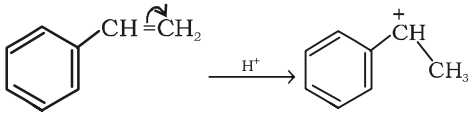
Because I_2 is least electronegative among halogens. Consult Q.1 also.

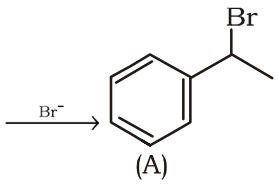
78. Ans (2)

79. Ans (1)

80. Ans (2)
According to Saytzeff's rule, the major product will be that one which contains more number of substituents around the double bond.

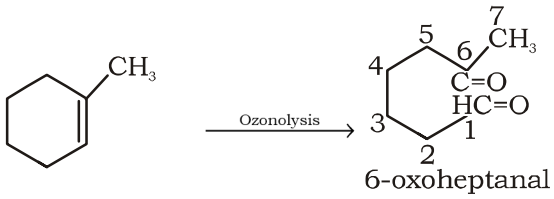
81. Ans (3)
Formation of A involves electrophilic addition reaction



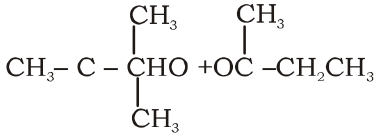


82. Ans (4)
Nitrosonium ion will go to p – position (the least hindered size) with respect to – OH group. Further dil. HNO_3 oxidises – NO group to – NO_2 group.

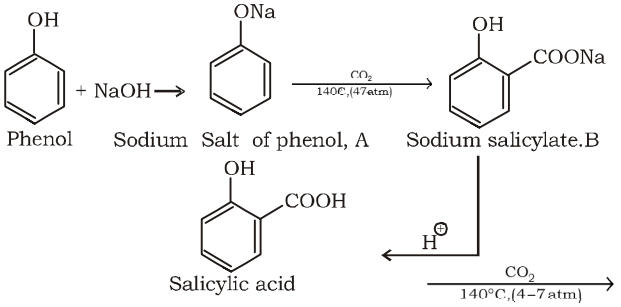
83. Ans (1)



84. Ans (1)



85. Ans (4)
Treatment of soidum salt of phenol with CO_2 under pressure brings about substitution of the – COOH group for the hydrogen of the ring. This is called as Kolbe's reaction



86. Ans (3)

(1) $R - \overset{O}{\overset{\|}{C}} - NH_2 \xrightarrow{Br_2 / NaOH} R - NH_2$
(Hofmann reaction)

(2) $R - \overset{O}{\overset{\|}{C}} - N_3 \xrightarrow{heat} R - NH_2$
Azide
(Curtius reaction)

(3) $R - \overset{O}{\overset{\|}{C}} - OH + HN_3 \xrightarrow{H_2SO_4} R - NH_2$
(Schmidt reaction)

$$R-\overset{\overset{O}{\|}}{C}-NHOH \xrightarrow{OH^-} R-NH_2$$

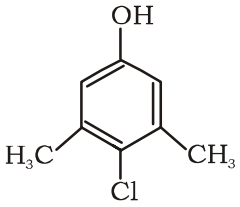
(4) **(Lossen reaction)**

Hydroxamic acid

87. Ans(4)
$NH_2 - CH_2 - COOH$ is glycine.

88. Ans (1)
$Al(C_2H_5)_3 + TiCl_4$ is Ziegler Natta catalyst

89. Ans (1)



Chloroxylenol
(4–chloro–3,5-dimethylphenol)

90. Ans (1)
Yellowish – green chlorine with suffocatin odour is evolved when sodium chloride mixed with manganese dioxide is heated with concentration H_2SO_4.

$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2\uparrow$