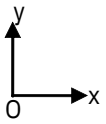
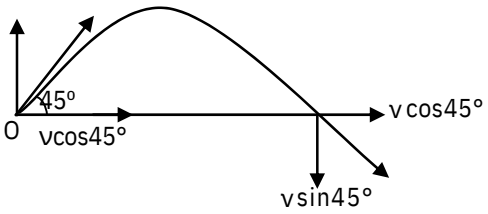
ANSWER KEY (AIPMT-2008)

Ques.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans	1	1	1	1	3	3	4	2	3	2	4	3	3	1	4	4	4	2	1	2
Ques.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans	4	1	3	1	4	4	2	3	1	3	4	4	3	1	1	2	2	3	1	3
Ques.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans	2	1	3	2	2	2	3	3	4	3	1	1	4	3	1	1	4	3	3	2
Ques.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
Ans	4	4	3	3	2	3	1	2	2	3	3	1	1	1	4	2	4	3	2	4
Ques.	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Ans	4	1	3	2	4	3	2	4	2	4	3	1	2	2	4	4	2	1	1	3
Ques.	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
Ans	3	4	4	3	4	3	4	3	2	1	3	1	3	1	3	4	4	1	2	3
Ques.	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140
Ans	3	2	3	1	2	2	4	3	3	4	4	4	3	2	2	1	3	4	3	4
Ques.	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
Ans	4	3	2	4	1	2	2	2	2	4	3	2	2	4	1	4	2	1	1	2
Ques.	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Ans	3	4	1	4	3	2	1	3	3	3	2	4	3	2	1	3	2	1	1	1
Ques.	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
Ans	2	4	1	1	2	3	2	4	3	4	4	3	3	1	4	4	1	4	3	3

HINTS & SOLUTIONS

1. Only vertical component of velocity changes during projectile motion so, there is change in momentum in vertical direction only.





Change in momentum = $\Delta\vec{P}$

$= \Delta P_x\hat{i} + \Delta P_y\hat{j}$, since $\Delta P_x = 0$

$= P_{fy}\hat{j} - P_{iy}\hat{j}$;

$P_{iy} = mv\sin 45°$, $P_{fy} = -mv\sin 45°$

$\Delta P = mv\sin 45°, -mv\sin 45°$

$= -2mv\sin 45° = -2mv\hat{j}$ $\Delta P = \sqrt{\quad}$

$= \sqrt{2m}v$

$-v$ e sign shows the direction of change in momentum in $-ve$ *y*-direction.

2. Flux linkage = Flux through each turn × number of turns

$\varphi = 500 \times 4 \times 10^{-3} = 2Wb$

since $\varphi = Li$

$L = \varphi 2 \Rightarrow = = = \frac{1}{2}H$

i

3. $\vec{q} \rightarrow \rightarrow \vec{F}\vec{B} = \vec{q}\vec{v} \times \vec{B}$, i.e. magnetic force is perpendicular to both velocity and magnetic field. A force $\perp r$, to V does no work or no power delivered by force which is $\perp r$, V hence no kinetic energy or speed will change.

since $P = \vec{F}.\vec{V} = 0$

As $F \perp r, V \perp r, dr.$

or $dW = F.dr = 0$

4. Distance covered in *n*th second,

$S_n = u + \frac{1}{2}a(2n-1)$;

$= 0 + \frac{1}{2} \times \frac{4}{3}(2 \times 3 - 1)$

$= \frac{1}{2} \times \frac{4}{3} \times 5 = \frac{10}{3}m$

5. de-Broglie wavelength associated with electron moving with velocity v, $\lambda = \frac{h}{mv}$

So, $\lambda_e = \frac{h}{9.1\times10^{-31}\times3\times10^{6}}$

Wavelength of particle of mass 1 mg moving with velocity v.

$\lambda_p = \frac{h}{10^{-3}\times v}$

As given, $\lambda_e = \lambda_p$

$\Rightarrow \frac{h}{10^{-3}\times v} = \frac{h}{9.1\times10^{-31}\times3\times10^{6}}$

$v = \frac{27.3\times10^{-25}}{10^{-3}} = 2.73\times10^{-21}\ ms^{-3}$

6. $F_{ext.} = \frac{d(mv)}{dt} = m\frac{dv}{dt} + v\frac{dm}{dt}$

m = mass of system as conveyor belt with sand drops at time t.

$F_{ext.} = m\frac{dv}{dt} + v\frac{dm}{dt}$

but const and $v \to t$, so, $\frac{dv}{dt} = 0$

$F = \frac{dm}{dt}v = Mv$

$F_{ext.}$ is in direction of v of belt.

OR

Since $m.dv = F + F_{reaction}$.....(i)

Consider belt as a system with variable mass m, m = mass of system at time t

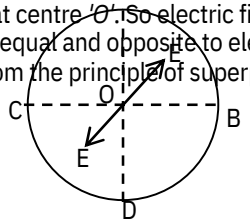
$F.dm = dm_{reaction} = -v$.....(ii)

$F\frac{dm}{dt} = \frac{dm}{dt}v = -v$.....(ii)

$F_{ext.} = v\cdot\frac{dm}{dt} = Mv$.

$\vec{F}_{ext}$ is in direction of $\vec{v}$ to keep belt moving with constant velocity.

7. Electric field due to the given charged ring is zero at centre '*O*'. So electric field due to *AKB* is equal and opposite to electric field due to *ACDB*, from the principle of superposition.



Since E is field strength of O along KO So electic field strength due to *ACDB* along $\vec{OK}$ and it is equal to E.

8. $R = R_0\cdot A^{1/3}$

So nuclear density $= \frac{A\cdot m}{v}$

m = mass of each nucleon, A = mass number

9. $\frac{3m}{4\pi R_0^3} = independent\ of\ A.$

Mass defect

$\Delta m = ZM_p + (A-Z)M_n - M(A,Z)$

Binding energy $= \Delta mc^2$

$BE = [ZM_p + (A-Z)M_n - M(A,Z)].c^2$

$M(A,Z) = ZM_p + (A-Z)M_n - BE - n - \frac{BE}{c^2}$

10. For constant acceleration

$v^2 = u^2 + 2as$

$(20)^2 = (10)^2 + 2\times a\times135$

$a = \frac{300}{270} ms^{-2}$

As $v = u + at$

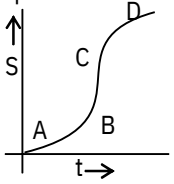
$20 = 10 + a\times t$

$10 = at$

$t = \frac{10}{\frac{300}{270}}$

11. $t = 9 sec$

In distance-time graph, the speed at instant is expressed by slope at that instant. The slope is maximum at C.



12. Heat required to boil water

$Q = mc\Delta T$

$= 1\times1\times(100-20) = 80 kcal$

Heat given by supply

$H = V.i.t = 220\times4\times t$

$H = Q$

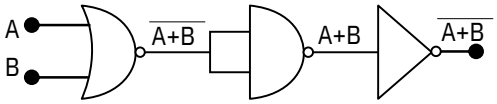
$\Rightarrow 220\times4\times t = 80{,}000$

$t = \frac{80{,}000}{220\times4} = \frac{1000}{11} sec$

$\frac{1000}{11\times60} = 1.5\ min$

13. In the phenomenon of electric discharge tube through gases at low pressure, the coloured glow in the tube appears as a result of collisions between the charged particles emitted from cathode and the atoms of the gas.

14. The output is the output of NOR gate hence the combination will act as a NOR gate.



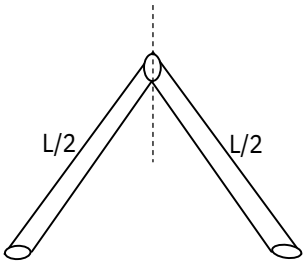
15. $V = \frac{4}{3}\pi r^3$

$\frac{\Delta V}{V} \times 100 = \times \times \frac{\Delta r}{r}$

% error in volume = 3×% error in radius

=3×2=6%

16.



Moment of inertia of the system

$I = \frac{M(L/2)^2}{3} + \frac{M(L/2)^2}{3}$

$= \frac{ML^2}{12} + \frac{ML^2}{12} + \frac{ML^2}{6}$

17. Frequency corresponding to 2eV is given by

$E = h\nu$

$\Rightarrow 2\times1.6\times10^{-19} = 6.6\times10^{-34}\times\nu$

$\nu = \frac{3.2\times10^{-19}}{6.6\times10^{-34}} = 5\times10^{14}$ Hz

18. $I = I_1 + I_2 + 2I_1I_2\cos\varphi$

$I_{max} = (I_1 + I_2)^2$

$I_{min} = (I_1 - I_2)^2$

$I_{max} + I_{min} = (I_1 + I_2)^2 + (I_1 - I_2)^2$

$= (I_1^2 + I_2^2 + 2I_1I_2) + (I_1^2 + I_2^2 - 2I_1I_2)$

$= 2(I_1^2 + I_2^2)$

19. In cyclic process since initial and final states are same internal energy is a state function therefore initial and final internal energies are also same. So change in internal energy is zero hence E = 0.

20. i_1 = 1 amp = current through 4Ω

i_2 = current through 3Ω and

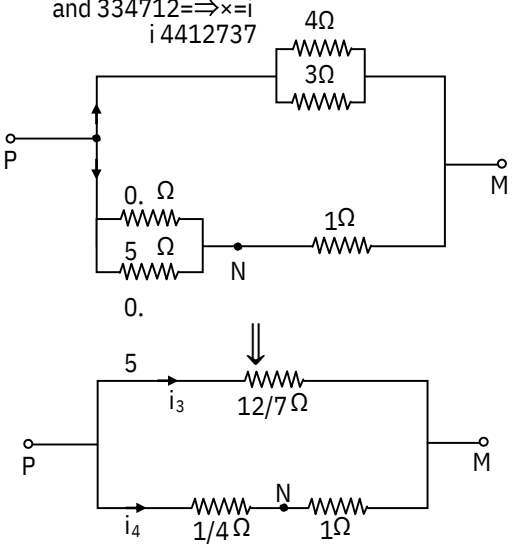
$i_1 = i_2 + i_3$

$i_4 = 2$ amp

$i_2 = \frac{4}{3}$ amp

$i_3 = i_1 + I_2 = 1 + \frac{3}{4} = \frac{7}{4}$ amp

and $i_1 = i_2 + i_3$



$\therefore i_4 = \frac{1}{6}$ amp = 3.2 amp

V_{NM} = P.D. across N and M = $i_4 \times 1\Omega$

= 3.2 × 1 = 3.2 volt

Second approach

V_{PM} = 1 A × 4Ω = 4 volt

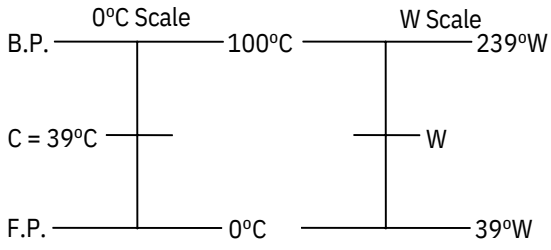
$V_{PN} + V_{NM} = 4$ V

$V_{PN} = 1$ and $V + V_{NM} = 4$

$4V_{NM} + V_{NM} = 4$

$\therefore V_{NM} = \frac{4}{5} = 3.2$ V

21.



W is the temperature on new scale corresponding to 39°C on °C scale.

So, $\frac{C - 0}{100 - 0} = \frac{W - 39}{239 - 39}$

$= -\Rightarrow \frac{CW}{C} = \frac{39}{100} \frac{100}{200}$

or $W = \frac{39}{100} \times 200 + 39$

$= \frac{39}{100} \times 200 + 39 = 78 + 39 = 117$

22. So, temperature on new scale is 117°W corresponding to 39°C.

Given $y = 0.25 \sin (10\pi x - 2\pi t)$

Comparing with equation of wave

$y = A \sin (kx - \omega t)$

$A = 0.25, k = 10\pi, \omega = 2\pi$

$\frac{2\pi}{\lambda} = 10\pi \quad 2\pi f = 2\pi$

$f = 1$ Hz

$\lambda = 0.2$ m $= \frac{1}{5}$

When sign of coefficient of t and x are opposite it means $\frac{dx}{dt} = V > 0$ i.e., wave is propagating in the direction of growing x.

23. Since

$V = \frac{Q}{4\pi\varepsilon_0 r}$ and $E = \frac{Q}{4\pi\varepsilon_0 r^2}$

Given $V = Q \times 10^{11} = \frac{Q}{4\pi\varepsilon_0 r}$

$\Rightarrow r = \frac{1}{4\pi\varepsilon_0 \times 10^{11} \times 10}$

i.e., $E = \frac{V}{r}$

$\Rightarrow E = QV = Q \times 10^{11} \times 4\pi\varepsilon_0 \times 10$

$= 4\pi\varepsilon_0 \times 10^{2-1} Q$ volt m

24. $C = \frac{1}{\text{velocity of em wave through medium having permittivity } (\varepsilon_0) \text{ and permeability } (\mu_0)} = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$

25. Path difference $\Delta x = x_1 - x_2 = 15 - 10 = 5$ m

$\lambda = vT = 300 \times 0.05 = 15$ m

$\frac{\Delta\phi}{2\pi} = \frac{\Delta x}{\lambda} = \frac{5}{15} = \frac{1}{3}$

$\Delta\phi = \frac{2\pi}{3}$

26. Maximum acceleration $a = \omega^2 A$

$\frac{a_1}{a_2} = \frac{\omega_1^2 A_1}{\omega_2^2 A_2} = \frac{(100)^2}{(1000)^2} = \frac{1}{100}$

27. Lattice parameter

$a = \frac{4r}{\sqrt{2}}$

$r = \frac{2a}{4} = \frac{2 \times 3.6}{4} \sqrt{2} = \frac{\sqrt{2}}{4}$

$= 0.9 \times 1.41 = 1.27$ Å

28. Energy used per sec–1 to operate turbine

$= mgh = 15 \times 10 \times 60$ joule

$= 9000$ joule

Power supplied to turbine = 9000 joule sec^{-1}

Power loss due to friction = 900 joule sec^{-1}

Power generated by turbine

$= (9000 - 900)$ joule sec–1

$= 8100$ joule sec–1 $= 8.1$ kW

Second approach

$P_{generated} = \text{input} \times \frac{90}{100} = \frac{mgh}{t} \times \frac{90}{100}$

$= \frac{15 \times 10 \times 60 \times 90}{100} = 8.1$ kW

29. Energy stored in capacitor for field

$E = \frac{1}{2} CV^2$

$= \frac{1}{2} \varepsilon_0 A (Ed)^2$

$= \frac{1}{2} \varepsilon_0 A E^2 d$

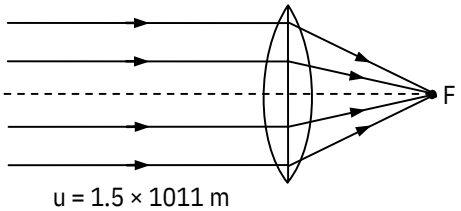
Energy stored in capacitor + Energy loss in the process of charging = Energy given by cell.

$= \frac{A\varepsilon_0}{d} 2EdV$

$= 2 \times$ Energy stored in capacitor

Since energy stored in capacitor = Energy loss in the process of storing the charge in capacitor.

30.



$u = 1.5 \times 10^{11}$ m

$u = f = 10$ cm $= 0.1$ m

$\frac{v}{u} = \frac{h_i}{h_0}$

$\Rightarrow \frac{0.1}{1.5 \times 10^{11}} = \frac{h_i}{1.39 \times 10^9}$

$h_i = \frac{1.39 \times 10^8}{1.5 \times 10^{11}} = 9.2 \times 10^{-4}$ m

31. Total force on the current carrying closed loop should be zero, if placed in uniform magnetic field.

F3

Fhorizontal = (F3 – F1)

Fvertical = F2

Resultant of F1, F2 and F3 is F

where $F = \sqrt{(F-F)2+F2312}$

Since total force = 0, hence force on QP is equal to Fin magnitude but opposite direction.

$F-231+2QP = \sqrt{(FF)F2}$

32. $R = \rho\frac{l}{A}$

Now, $l = l + l = \frac{11l}{10}$

and therefore, $A = \frac{10A}{11}$

P1*l*×□1□□□

So R′ = □10□2 = × (11) ρ*l*/1.21 R

□10A □ (10)2 A

□11□

Now resistance becomes 1.21 times of initial and specific resistance is the intrinsic property so remains same.

33. Curie temperature is that temperature above which a ferromagnet becomes paramagnet.

34. Energy density and Young's modulus have same dimensions and equal to [ML–1T–2]

35. Dielectric constant and refractive index are dimensionless.

Since E0 = – 13.6 eV ; Energy in the excited state

$= -13.6 = -3.4$ eV

4

ΔE = Excitation energy

= Energy needed to raise the electron from ground state to higher level

= – 3.4 + 13.6 = 10.2 eV

36. A

Voltage gain = V, $\frac{A}{1+\beta.AV}$

where = 9β = 0.09, voltage gain = 10

100

$\Rightarrow 10 = \frac{A}{19+.A}$

$\Rightarrow AV = \frac{100V}{0.1} = 100$

37. Current through galvanometer

$I = \frac{3V}{50\Omega + 2950\Omega} = 10-3$ A

Current for 30 division = 10–3 A

Current for 20 division = $\frac{20}{30} \times 10-3$

$= 2\times 10-3$ A = 3

$\frac{3}{50+R}$

$\Rightarrow$ R = 4450 Ω

38. m11 = m2υ2

gun shell

4 ×υ1 = 200× υ

$\frac{1000}{2} = \frac{\upsilon}{\upsilon}$

2= 20 ...(1)

1

$\frac{1}{2}m22311 + \frac{1}{2}m2\upsilon = 1.05 \times 10$

2υ2 +1231υ

102 = 1.05 ×10 ...(2)

By equation (1) and (2)

υ2 = 100 m/s

39. e = E0 sin ωt

i = I0 sin (ωt – φ)

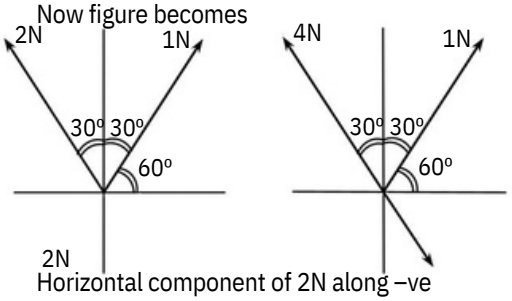
Pav. = Erms . Irms . cos φ

$\frac{E}{2} = 0I. \frac{0}{\sqrt{2}} \cos\varphi / \sqrt{2} = E0I0 \cos\varphi$

40. 4N and 2N are opposite

So net = 4 – 2 = 2N

Now figure becomes

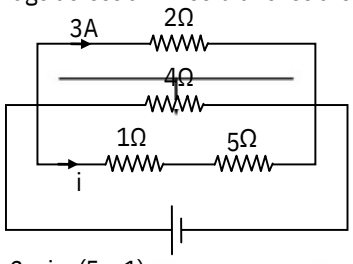


Horizontal component of 2N along –ve x-direction is x1 = 2 sin 30° = 1 N

Horizontal component of 1 N along +ve x-direction is x2 = 1 cos 60° = $\frac{1}{2}$N

So, net horizontal force is $\frac{1}{2}$N along –ve x-direction, hence 1N is required in +ve x-direction

41. Voltage across all three branches are same, i.e.,



$3 \times 2 = i \times (5 + 1)$

$i = 1A$

Power dissipated in 5Ω

$P = i^2 R$

$= (1)^2 \times 5 = 5$ watt

42. $x - 5\lambda t_1 = N_0 e$

$x - \lambda t_2 = N_0 e$

$\frac{x_1}{x_2} = e^{-5\lambda t + \lambda t}$

$\frac{1}{e} = e^{-4\lambda t}$

$e - 1 = e^{-4\lambda t}$ $t = 1 \Rightarrow \frac{1}{4\lambda}$

43. $E_{incident} = W + K_{max}$; $K_{max} = eV_0$

$h\nu = h\nu_0 + eV_0$; stopping potential $= V_0$

$\frac{hc}{\lambda} = 6.2e + 5e$

$\lambda = \frac{h \times c}{6.63 \times 10^{-34} \times 3 \times 10^8} = \frac{11.2 \times 1.6 \times 10^{-19}}{11.2 \times 1.6 \times 10^{-19}}$

$= 1.1 \times 10^{-7}$ m

Hence the wavelength of ultraviolet region.

44. $x = a \sin\left(\omega + \frac{\pi}{6}\right)$

$v = \frac{dx}{dt} = a\omega \cos\left(\omega + \frac{\pi}{6}\right)$

$v_{max} = a\omega$

$\omega = \frac{\pi}{2} \Rightarrow t = \frac{\pi}{\omega}$

$t = \frac{\pi}{\omega} = \frac{\pi}{\pi} \times 6 = 6$

$t = \frac{T}{6} = \frac{\pi}{6 \times 2} = \frac{1}{12}$

45. $P = P_1 + P_2 = +1$

$f_1 f_2$

$f = \frac{f_1 f_2}{f_1 + f_2}$

46. $P = \frac{1}{f_1} + \frac{1}{f_2}$

$PV = nRT$ or $PV = 1RT$

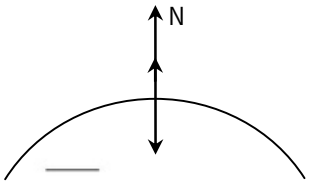
or $P = RT \rho$ $\Rightarrow \rho \propto \frac{1}{T}$

$\frac{\rho_1}{\rho_2} = \frac{P_1 T_2}{P_2 T_1}$ or $\frac{\rho_1}{\rho_2} = \frac{283}{383}$

$\rho_2 = \frac{\rho_1 \times 283}{383}$

or $\frac{\rho_2}{\rho_1} = \frac{283}{383}$

47. $mg - N = \frac{mv^2}{r}$



When N = 0, for weightlessness

$mg = \frac{mv^2}{r}$

$v^2 = rg \Rightarrow v = \sqrt{20 \times 10} = \sqrt{200}$

$= 14.14$

48. $A = \pi r^2 = 0.04\pi$

$\varphi = BA \cos\theta$

$= 1 \times 0.04\pi \times \cos 60^\circ = 0.02$ Wb

49. $MK_2 MR_1^2 =$

$K_1 = R$

$\frac{MR^2}{MK_2^2} = \frac{\sqrt{}}{\sqrt{}}$

$K_2 = R$

$\frac{2}{\sqrt{}}$

$K_2 = 2 = 1\sqrt{}$

$K_1 R_2$

50. $E \propto l$ and $E - E.r \propto l$

$Rr_2 +$

$r + R \Rightarrow = 1$

$R l_2$

l

$1 \Rightarrow = R$

l_2

$= 110 - 100 \times 10 = 1\Omega$

100

51. In case of diatomic molecules (X_2) of halogens the bond dissociation energy decreases in the order :

$Cl_2 > Br_2 > F_2 > I_2$

The oxidizing power, electronegativity and reactivity decrease in the following order :

$F_2 > Cl_2 > Br_2 > I_2$

Electron gain enthalpy fo halogens decreases in the following order :

Cl2 > F2 > Br2 > I2

The low value of electron gain enthalpy of fluorine is due to small size of fluorine atom.

52. The average translational KE of one molecule of an ideal gas is as follows :

KTt = KE= 3/2R= 3KT

NA NA 2

When R/NA = Boltzmann constant

i.e., Et ∝ T

Thus, at constant temperature KE of molecules remains same.

53. 2AB2(g) 2AB(g) + B2(g)

2 0 0 initially

2(1 – x) 2x x at eq.

Total amount of moles at equilibrium

= 2 (1 – x) + 2x + x = 2 + x

$$K_p = \frac{[P_{2AB}][P_{B}]}{[P_{2AB}]^2}$$

$$K_p = \frac{\left(\frac{2x}{2+x} \times P\right)\left(\frac{x}{2+x} \times P\right)}{\left(\frac{2(1-x)}{2+x} \times P\right)^2}$$

$$K_p = \frac{4x^3}{(2+x)^3} \times P$$

$$K_p = \frac{4x^3}{4(1-x)^2} \times P$$

$$K_p = 4x \times P \times \frac{1}{2^3} \text{ (As } 1 - x \sim 1 \text{ and } 2 + x \sim 2)$$

$$x = (8K/4P)^{1/3} = (2K/P)^{1/3} \text{ pp}$$

54. According to the given data, when concentration of Br2 is doubled, the initial rate of disappearance of Br2 remains unaffected. So order of reaction with respect to Br2 is zero. The rate law for the reaction will be :

k [CH+3COCH3] [H]

55. $Fe(OH)_{(s)} \rightleftharpoons Fe^{3+}_{(aq.)} + 3OH^-_{(aq.)}$

$$K = \frac{[Fe^{3+}][OH^-]^3}{[Fe(OH)_3]}$$

$$K = [Fe^{3+}][OH^-]^3$$

(as activity of solid is taken unity)

Concentration of OH– ion in the reaction is decreased by 1/4 times then equilibrium concentration of Fe3+ will be increased by 64 times in order to keep the value of K constant.

56. $CH_4 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

1 5 3 4 (Volume)

So 1 volume or 1 litre of propane requires 5 volume or 5 litre of O2 to burn completely.

57. pH = – log+10 [H]

[H+] = 10–pH

[H+] of solution 1 = 10–3

[H+] of solution 2 = 10–4

[H+] of solution 3 = 10–5

Total concentration of [H+]

The volume taken in each case is 1 L

$= 10^{-3}\left(1 + 1 \times 10^{-1} + 1 \times 10^{-2}\right)$

$= 10^{-3}\left(\frac{1}{1} + \frac{1}{10} + \frac{1}{100}\right)$

$= 10^{-3} = 1.11 \times 10^{-3}$

$\left(\frac{111}{100}\right)$

Therefore, H ion concentration in mixture of equal volume of these acid solutions

$= \frac{1.1110}{3} = 3.7 \times 10^{-4}$ M

58. The relative reactivities of acyl compound towards nucleophilic substitution will depend upon the nature of leaving group ability. Weak bases are good leaving group.

$$Cl^- < R{-}\overset{\overset{O}{\|}}{C}{-}O^- < R{-}O^- < \ddot{N}H_2^-$$

Basic strength increases

$$\therefore \quad Cl^- > R{-}\overset{\overset{O}{\|}}{C}{-}O^- > R{-}O^- > \ddot{N}H_2^-$$

Leaving group abilities increases

$$\therefore R{-}\overset{\overset{O}{\|}}{C}{-}Cl > \left(R{-}\overset{\overset{O}{\|}}{C}\right)_2O > R{-}\overset{\overset{O}{\|}}{C}{-}OR > R{-}\overset{\overset{O}{\|}}{C}{-}NH_2$$

59. DN A contains two types of nitrogenous bases, i.e.,

Purine → Adenine (A), Guanine (G)

Pyrimidine → Cytosine (C), Thymine (T) Adenine pairs with thymine (A : T) by two hydrogen bonds and Guanine with Cytosine (G : C) by three hydrogen bonds.

60. $H{-}\underset{sp}{C}\equiv\underset{sp}{C}{-}H > CH_2{=}CH_2 > CH_3{-}CH_3$

sp sp2 sp2 sp3 sp3

(Acidic character)

Conjugate base of the given acid is as follows :

$C^{\ominus}{\equiv}C{-}H < {}^{\ominus}CH_2{-}CH_3$

(Basic character)

So conjugate base of stronger acid is weaker and vice-versa.

61. Equimolar solutions of the given chlorides when prepared in water forms their respective hydroxides. Be(OH)2 is amphoteric, but the hydroxides of other alkaline earth metals are basic. The basic strength increases down the group. Therefore higher the basic character higher will be the pH.

62. As smaller the size of cation, higher will be hydration and its effective size will increase so mobility in aqueous solution will decrease.

63. According to Heisenberg uncertainty principle

$$\Delta p \cdot \Delta x \geq \frac{h}{4\pi}$$

$$m\Delta v.\Delta x \geq \frac{h}{4\pi}$$

$$(m.\Delta v)2 \geq \frac{h}{4\pi}$$

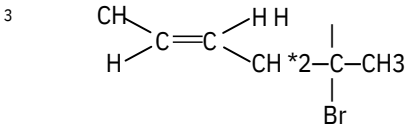
$$\Delta v \geq 1(h/\pi) \sqrt{\quad}$$

$$2m$$

64. Given compound,

CH3CHCHCH2CHBrCH3

may also be written as follows :



Both geometrical isomerism (cis-tran s form) and optical isomerism is possible in this compound.

Number of optical isomer = 2n = 21 = 2

(Here n = number of asymmetric carbon)

Therefore, total number of stereoisomers = 2 + 2 = 4

65. [Fe(CN)3–6] → [Fe(CN)]4–6, E° = +0.35 V

Fe3+ → Fe2+ , E° = +0.77 V

Higher the positive reduction potential, stronger is the oxidizing agent. Oxidizing agent oxidizes other compounds and gets itself reduced easily.

66. As ionization enthalpy (both first and second) increases from left to right across the period. Only chromium is exceptional due to the stable configuration (3d5) so the correct order is :

Cr > Mn > V > Ti

66. The electron density of 'phenol ring' is most among chloro benzene, benzyl alcohol and nitrobenzene.

In phenol, due to 'OH' group there will be both +M and "–I". But +M-effect of 'OH' dominates over its "–I".

68. $He^+ < O^- < NO < C_2^{-2}$

Bond order 0.5 1.5 2.5 3.0

69. $PbO + 2HCl \rightarrow PbCl_2 + H_2O$

x mole 2x moles x mole

6.5 3.2

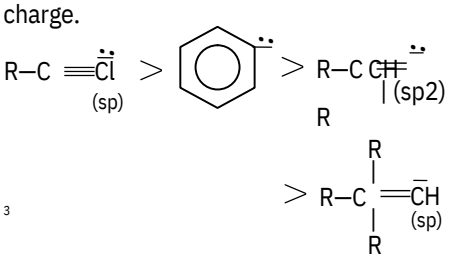
mole mole

224 36.5

= 0.029 mole = 0.087 mole

Thus, 0.029 mole of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl.

70. More is the electronegativity of hybrid atom, more will be its tendency to retain the (–)ve charge.

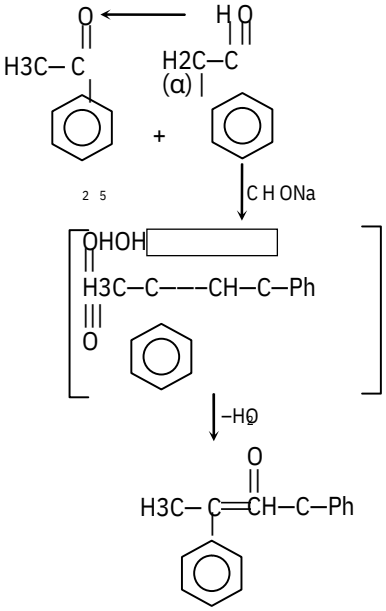


The electronegativity of hybrid orbitals, depends on their 's' character. It follows given order,

sp > sp2 > sp3

← electron negativity increases

71. Acetophenone when reacted with base like C2H5ONa, will undergo aldol condensation reaction with simultaneous loss of H2O molecule.



72. Weight of 6.023 × 1023 molecules of water = 18 g

As volume occupied by 6.023 × 1023 molecules of water (density = 1 g cm–3) will be

= 18g3
1gcm ———=3 = 18 cm or mL

So volume occupied by one molecule of water

= 18 = 2.988 × 10–23
6.023 × 10 23
= 3.0 × 10–23 cm3

73.

H2 + Cl2 → 2HCl

ΔHreaction = Σ(BE)reactant – Σ(BE)product
= [(BE)H—H + (BE)Cl—Cl] – [2(BE)H—Cl]
= 434 + 242 – (431) × 2
= – 186 kJ

As ΔHreaction = – 186 kJ
So enthalpy of formation of HCl

= –186kJ
2 ———
= – 93 kJ mol–1

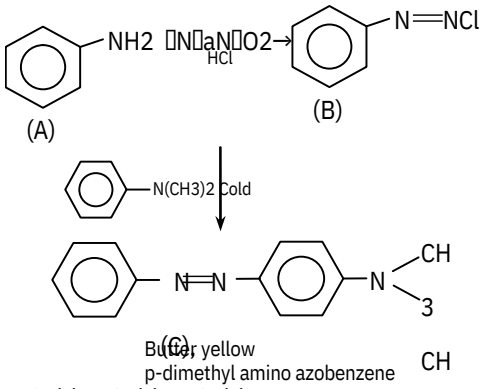
74.

The oxidation state of Co in [Co(OX)–2(OH)2] is +5. This is not possible. The oxidation state of Ti in [Ti(NH3+3+3)6] is +3. Ti has just one unpaired electron. O.S. of 'V' in [V(gly)+2(OH)2(NH3)2] is again +3 and it means the number of unpaired electrons is 2. Oxidation state of Fe in [Fe(en) (bpy) (NH2+3)2] is +2. So it contains 4 unpaired electron. More is the oxidation number of unpaired electron more will be the paramagnetic character.

75.

Natural rubber is cis-1,3-polyisoprene and has only cis-configuration at energy double bond.

76.



77.

PCl5(g) PCl3(g) + Cl2(g)
ΔH = ΔE + ΔnRT
Here, Δn = Change in number of moles of product and reactant
As Δn = +ve, so ΔH = +ve
ΔS = Sproduct – Sreactant
ΔS = +ve

78.

Uncertainty in momentum
(mΔυ) = 1 × 10–18 g cm s–1
Uncertainty in velocity
) = 11018(Δυ1.1 × 109 cm s–1
91028 = ———
× –

79.

The angular shape of ozone molecule consists of 2 sigma and 1 pi-bond.

80.

For body centered cubic structure, packing fraction = 0.68, i.e., 68% of the unit cell is occupied by atoms and 32% is empty.

81.

HI(g) 1/2H2(g) + 1/2I2(g)

= [H2]1/2[I2]1/2K= 8
[HI]

H2(g) + I2(g) 2HI(g)

K[HI]2′ = = (1/8)2
[H2][I2]
K′ = 1/64

82.

X Y + Z ...(1)
A 2B ...(2)
X Y + Z
Initially 1 0 0
At eq. 1–α α α
Total no. of moles at equilibrium
= 1 – α + 2α = 1 + α

A 2B
Initially, when t = 0 1 0
At eq. 1 – α 2α
Total no. of moles at equilibrium
= 1 – α + 2α = 1 + α

KPY×PZ [(α/1+α)P1][α/1+α)×P= =1]p
PX [1– α/1+ α]×P1
K (P)2[(2α/1+α)×P]2p=B= 2
PA [1– α/1+ α]×P2
Kp
1 = P1
Kp4P
2 2
P1
= 36= 36 : 1
P21

83.

Thyroxine and adrenaline are amine hormone. These are water soluble hormones having amino groups.

84.

According to Kohlrausch's law "At infinite dilution, each ion makes definite contribution to molar conductance of an electrolyte whatever be the nature of the other ion of the electrolyte"
∞ ∞ ∞
Λm = λ+ + λ–
λ∞∞+
and λ– are molar ionic condutance at infinite dilution for cations and anions, respectively.

Element composition	%	Mole ratio	Simple ratio	
C	38.71	38.71/12	3.22/3.22	= 3.22 = 1
H	9.67	9.67/1	9.67/3.22	= 9.67 = 3
O	51.62	51.62/16	3.22/3.22	= 3.22 = 1

85. Green chemistry means such reaction which reduce the use and production of hazardous chemicals.

86. Packing fraction for a cubic unit cell is

$$f = z \times \pi \frac{4/3 r^3}{d^3}$$

Here a = edge length, r = radius of cation and anion

Efficiency of packing in simple cubic or primitive cell = π/6 = 0.52

i.e., 52% of unit cell is occupied by atoms and 48% is empty.

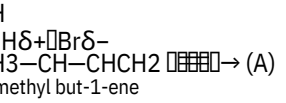
87. As primary is more reactive than secondary and tertiary alkyl halides so CH3CH2Br has the highest relative rate.

88. NO > NO+2NO−2 > 2

89. 132° 130° 115° (Bond angles)

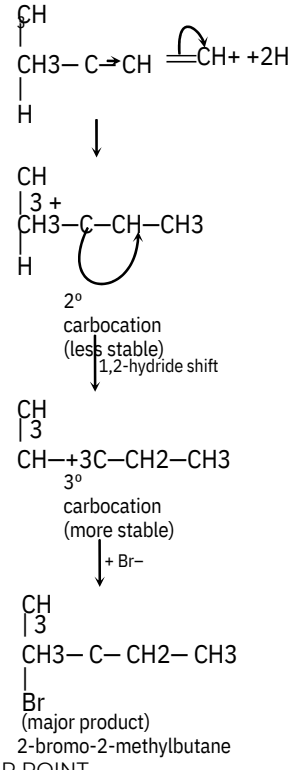
90. If silicon is doped with any of the element of group III (B, Al, Ga etc.) of the periodic table, p-type of semiconductor will be obtained.

The reaction occurs as follows :



3-methyl but-1-ene

Mechanism :



(major product)

2-bromo-2-methylbutane

91. Atomic mass of C = 12, H = 1 and O = 16

Thus empirical formula of the compound is

92. CH3O.

CFSE in octahedral field depends upon the nature of ligands. Stronger the ligands larger

93. will be the value of Δoct.

The ionic character of the bonds in hydrides increase from LiH to CsH so thermal stability of these hydrides decreases as follows :

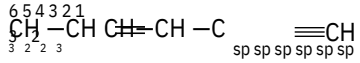
94. LiH > NaH > KH > RbH > CsH

State functions or state variables depend only on the state of the system.

Here 'w' represents work done and 'q' represents

95. amount of heat so both of these are not state functions.

In the following hydrocarbon



96. The state of hybridization of carbons 1, 3 and 5 are sp, sp3 and sp2 respectively.

[5e + MnO− + 8H+4 → Mn2+ + 4H2O ...(i)] × 2

[CO2−24→ 2e + 2CO2 ...(ii)] × 5

MnO− + 16H+ + 5CO2− 2Mn2+424→ + 10CO2

As 2 moles of MnO−4 required to oxidize 5 moles of oxalate.

So number of moles of MnO−4required to oxidize 1 mole of oxalate = 2/5 = 0.4.

k16 e−2000/T 1 = 10

97. k15 e−1000/T 2 = 10

The temperature at which k1 = k2 will be

1016 e−2000/T = 1015 e−1000/T

e−2000/T 15

= 10

e−1000/T 1016

e−1000/T = 10−1

log−1000/T−1 e e = loge 10

2.303 × log−1000/T = 2.303 × log 10−110 e10

−1000

× log e = − 1

T10

On solving, we get

T = 1000/2.303 K

98. A strong base can abstract an α-hydrogen from aldehyde and ketones to form a carbanion or the enolate ion.

99. $C_5H_{12}(g) + 8O_2(g) \rightarrow 5CO_2(g) + 6H_2O(l)$
$\Delta G^o = [(-394.4 \times 5) + (-237.2 \times 6)]$
$- [(-8.2) + (8 \times 0)]$
$= -3387.5$ kJ
The standard free energy change of elementary substances is taken as zero.
For the fuel cell, the complete cell reaction is :
$C_5H_{12}(g) + 8O_2(g) \rightarrow 5CO_2(g) + 6H_2O(l)$
This reaction is the combination of the following two half reactions :
$C_5H_{12}(g) + 10H_2O(l) \rightarrow$
$5CO+2(g) + 32H + 32e$
$8O\ 32H+2(g) + + 32e \rightarrow 16H_2O(l)$
As the number of electrons exchanged is 32 here, so n = 32
$\Delta G^o = - nFE^o$
-3387.5×103 J $= -32 \times 96500$ J/volt $\times E^o$
On solving, we get
$E^o = 1.09698$ V

100. For simple cubic :

$r + / r - = \frac{a}{2}$

Here a = edge length and
r +/r – = interatomic distance
For body centered :

$r + / r - = \frac{a\sqrt{3}}{4}$

For face centered :

$r + / r - = \frac{a\sqrt{2}}{2\ \ 2}$

Therefore ratio of radii of the three will be

$\frac{a}{2} : \frac{a\sqrt{3}}{4} : \frac{a}{2\ \ 2}\sqrt{2}$