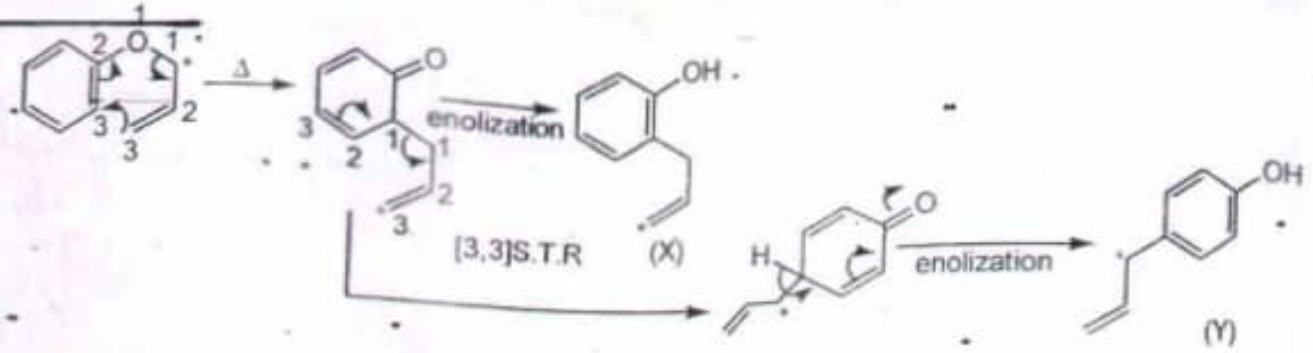
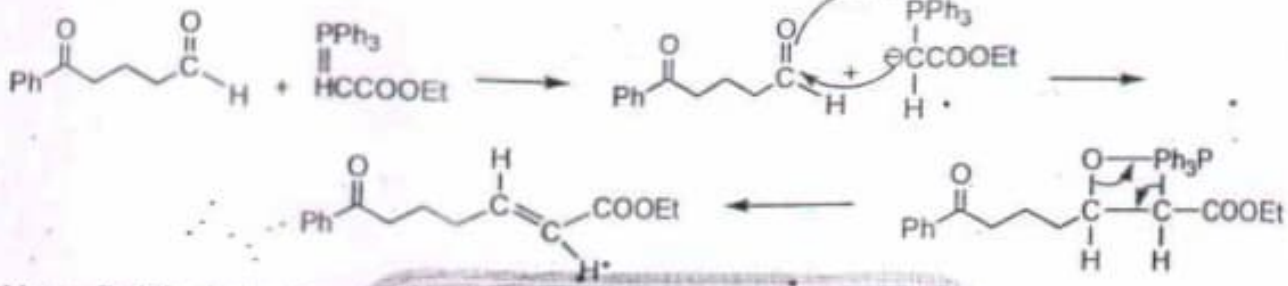
11.



Correct option is (b)

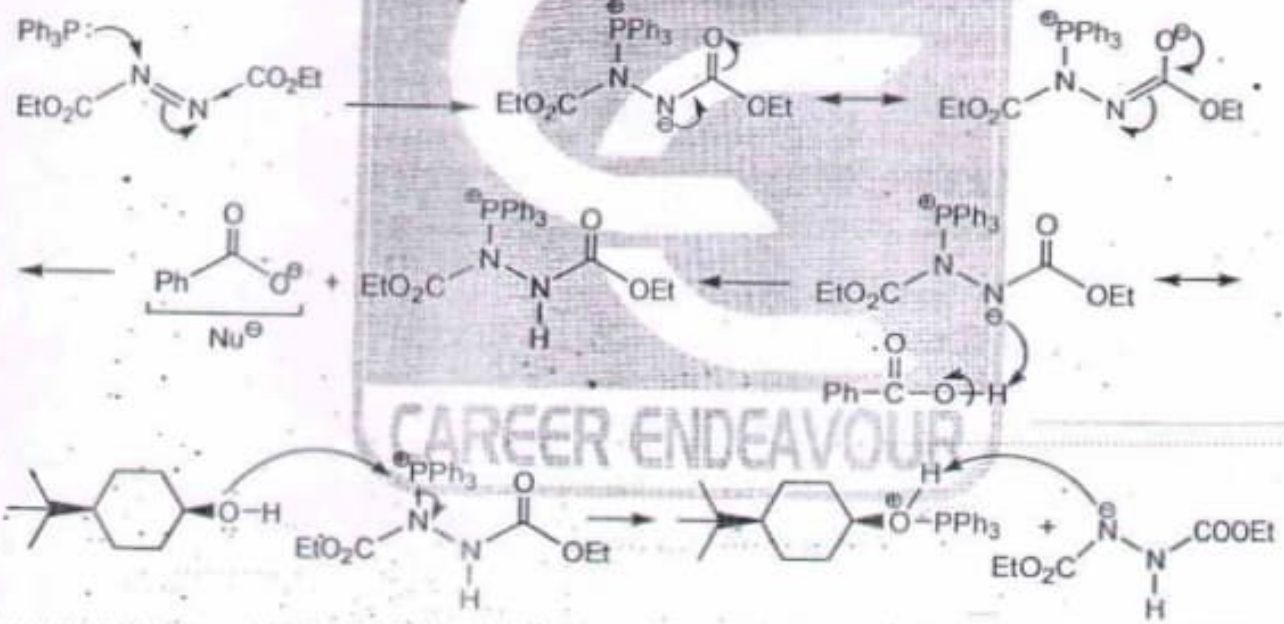
12.

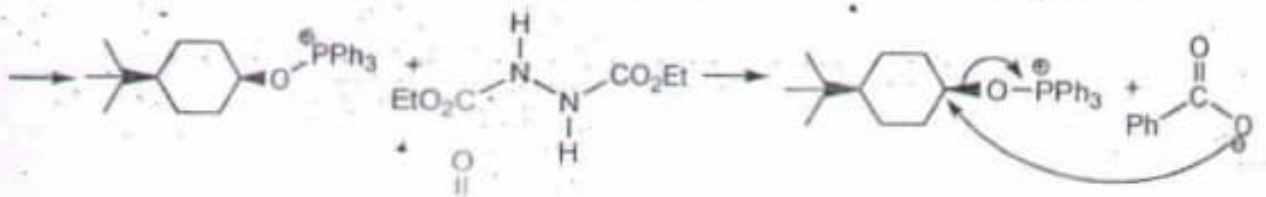


Note :- Stablised phosphorous ylide form trans alkene.

Correct option is (c)

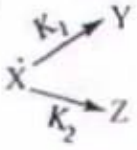
13.





Correct option is (d)

SOLUTION

20. 

$K_1 = 10^{-4} s^{-1}$

$\frac{[Y]}{[Z]} = \frac{1}{4}$

$\frac{[Y]}{[Z]} = \frac{K_1}{K_2} = \frac{1}{4}$; $K_2 = 4K_1 = 4 \times 10^{-4} s^{-1}$

Correct option is (c)

21. $\nu_{CO} \propto \frac{1}{\text{electron density on metal}}$

electron density on metal decreases then M–C bond strength decreases

C–O bond strength increases

NMe_3 is stronger σ-donar

PX_3 are σ – donar as well as π – acceptor

The σ – donating ability $NMe_3 > PMe_3 > P(OPh)_3 > PCl_3$

Hence, ν_{CO}-$Mo(CO)_5 PCl_3 > Mo(CO)_5 P(OPh_3) > Mo(CO)_5(PMe_3) > Mo(CO)_5(NMe_3)$

Correct option is (c)

22. $2Fe + \frac{3}{2}O_2 \longrightarrow Fe_2O_3$

2×56 $\quad$ $2 \times 56 + 16 \times 3$

112 $\quad$ 160

112 gm iron yield Fe_2O_3 = 160 gm

2.5 gm iron yield $Fe_2O_3 = \frac{160}{112} \times 2.5 = 3.571$

% of iron $\frac{0.391}{3.571} \times 100 = 10.94$

Correct option is (a)

23. $Ph_3\ddot{P} + Me\ddot{-}I \longrightarrow (Ph_3\overset{\oplus}{P}-(Me))\overset{\ominus}{(I)}$

$Ph_3\overset{\oplus}{P}-CH_2-H \xrightarrow{nBuLi} Ph_3\overset{\oplus}{P}-\overset{\ominus}{C}H_2 \longrightarrow Ph_3P=CH_2$

Correct option is (b)

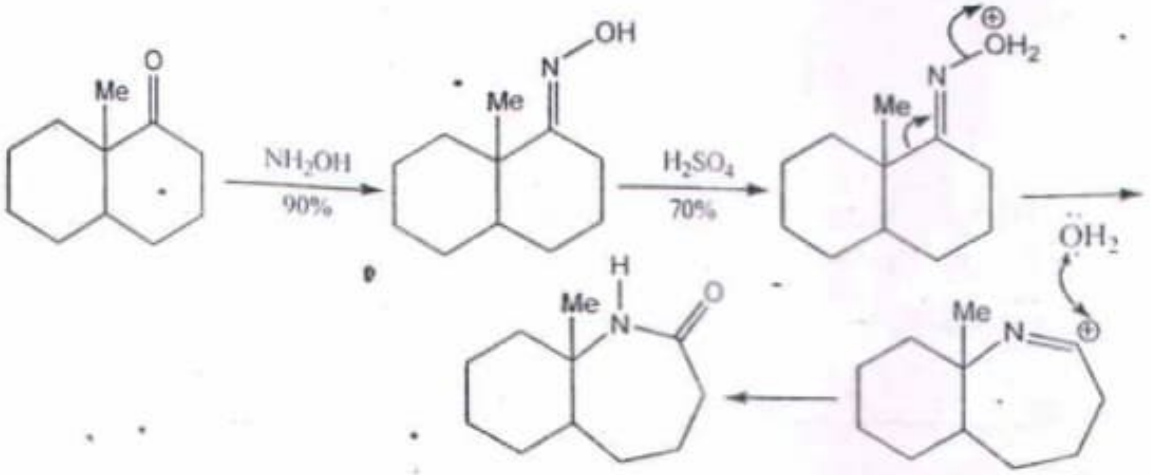
24. $HD \longrightarrow {}^1H$ NMR

Multiplicity = (2NI + 1) = (2×1×1+1) = 3 triplet

1 : 1 : 1

Correct option is (c)

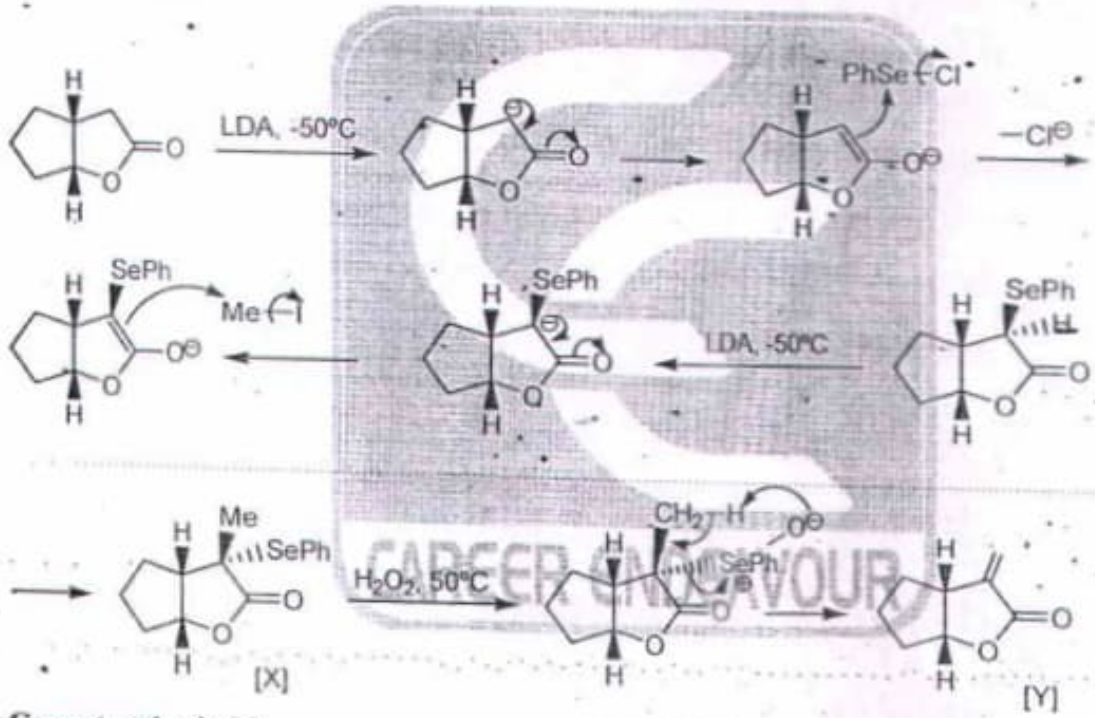
36.



$$\% \text{ yield} = \frac{90 \times 70}{100} = 63\%$$

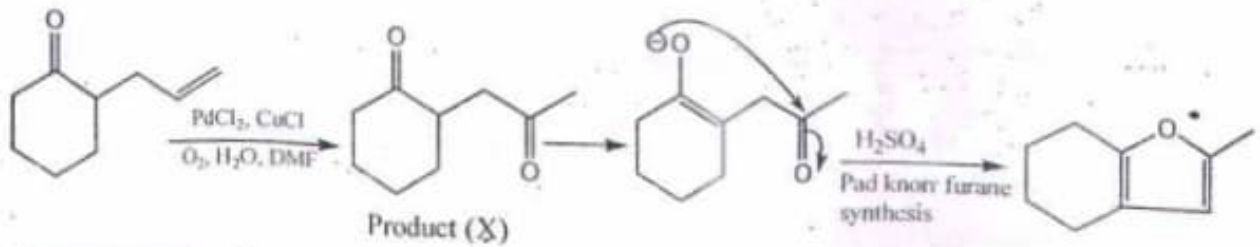
Correct option is (b)

37.



Correct option is (a)

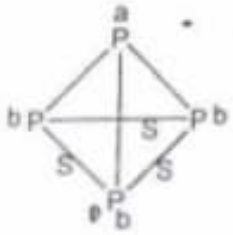
38.



Correct option is (d)

OBJECTIVE QUESTION

1. P_4S_3

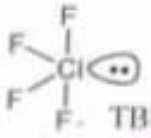


$^{31}P\ NMR = (2NI_P + 1)(2NI_P + 1)$

$= \left(2\times1\times\frac{1}{2}+1\right)\left(2\times3\times\frac{1}{2}+1\right)$

$= \underset{\text{Doublet}}{2} \qquad \underset{\text{Quartet}}{4}$

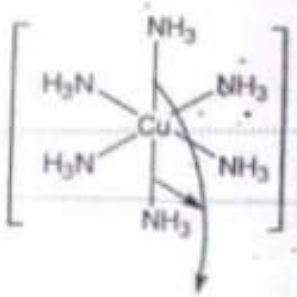
Correct option is (c)

2. 

TBP

Correct option is (d)

3. $\left[Cu(NH_3)_6\right]^{2+}$ complex show Jahn-teller distortion due to which it form distorted octahedral geometry and axials bond are longer than equitorial bond.



axial bond larger

Correct option is (b)

4. $COCl_2 + 4NH_3 \rightarrow CO(NH_2)_2 + 4NH_4Cl$

Phosgene

Correct option is (c)

5. $\left[(C_5H_5)Fe(CO)_2\right]_2$

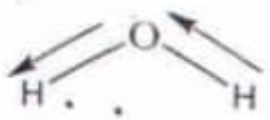
TVE = 2Fe = 8×2 = 16 electron

$2C_P = 5\times2 = 10$ electron

$4CO = 2\times4 = 8$ electron

Total = 34 electron

SOLUTION

56. 

In asymmtric stretching C_2 is absent only molecular plane is present. So, irreducible representati sponding to B_1.

Correct option is (b)

57. $PCl_5 + NH_4Cl \xrightarrow[150°C]{C_6H_5Cl(solvent)} N_3P_3Cl_6$

Correct option is (c)

58. **Correct option is (d)**

59. $X + Y \underset{K_2}{\overset{K_1}{\rightleftharpoons}} Z\,(fast)$

$Z \xrightarrow{K_3} P\,(slow)$ Since $K_2 >> K_3$

$r = K_3[Z]$; $\frac{K_1}{K_2} = \frac{[Z]}{[X][Y]}$

or $[Z] = \frac{K_1}{K_2}[X][Y] \Rightarrow r = \frac{K_3 K_1}{K_2}[X][Y]$

Correct option is (a)

60. $K = Ae^{-E_a/RT}$

$\ln K = \ln A - \frac{E_a}{RT}$; $K = \frac{K_1 K_3}{K_2}$

$\ln K = \ln K_1 + \ln K_3 - \ln K_2 = \ln A_1 - \frac{E_{a_1}}{RT} + \ln A_2 - \frac{E_{a_2}}{RT} - \ln A_3 + \frac{E_{a_2}}{RT}$

$= \ln\left(\frac{A_1 \cdot A_2}{A_3}\right)\frac{-1}{RT}\{E_{a_1} + E_{a_3} - E_{a_2}\}$

Correct option is (c)

47. $2NO(g) + O_2(g) \longrightarrow 2NO_2(g)$

$\Delta H = 2 \times \Delta H_f^0(NO_2) - \{2 \times \Delta H_f^0(NO) + \Delta H_f^0(O_2)\}$

$\Delta H = 2 \times 33.2 - \{2 \times 90.3 + 0\}$; $\Delta H = -114.2$ kJ.

Correct option is (c)

48. When $\Delta ng = 0$ then pressure has no effect on equilibrium.

In option (d) : $\Delta ng = 4 - 4 = 0$.

Correct option is (d).

49. $\Delta G = nRT \ln\left(\frac{P_2}{P_1}\right)$; $\Delta G = 1\,RT \ln\left(\frac{2}{1}\right)$; $\Delta G = RT \ln 2$

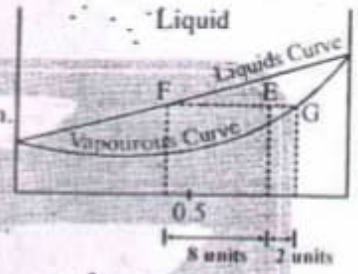
Correct option is (a)

50. $\frac{\text{Amt. of liquid at E}}{\text{Amt. of vapour at E}} = \frac{EG}{FE}$

$\frac{\text{Amt. of liquid}}{\text{Amt. of vapour}} = \frac{2}{8} = \frac{1}{4}$

$\frac{\text{Amt. of liquid}}{\text{Amt. of vapour}} + 1 = \frac{1}{4} + 1$

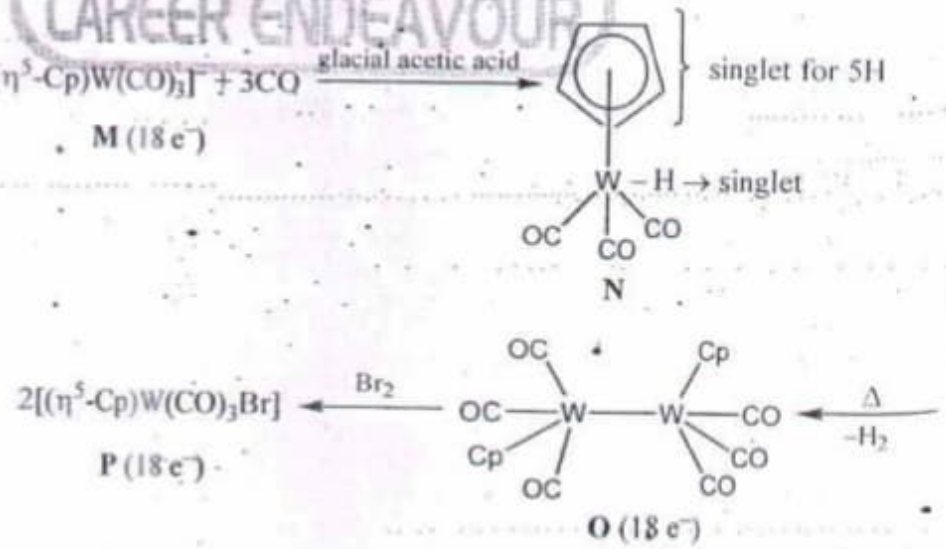
$\frac{\text{Amt. of liquid + Amt. of vapour}}{\text{Amt. of vapour}} = \frac{5}{4}$



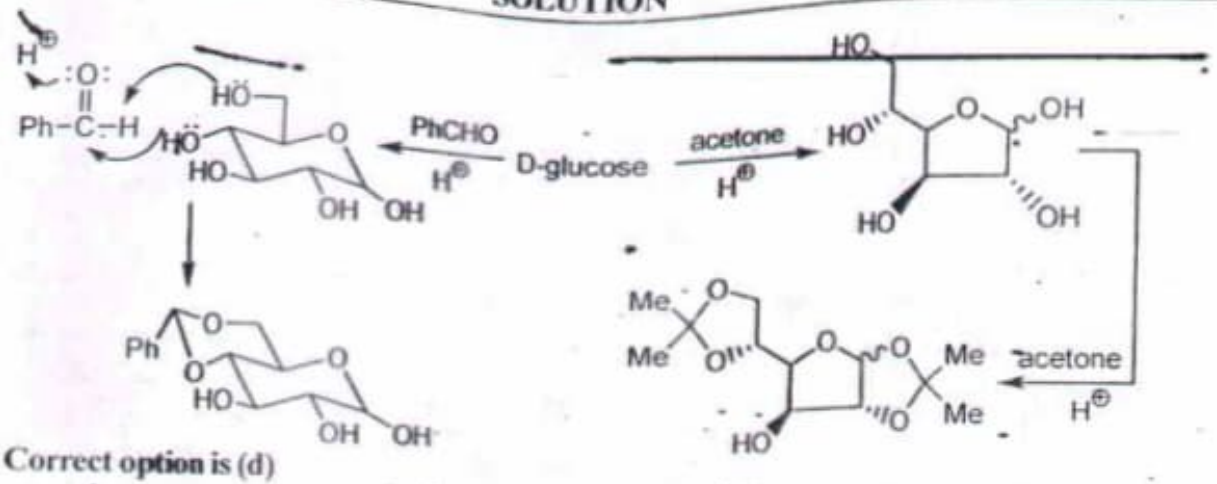
$\Rightarrow \frac{\text{Amt. of vapour}}{\text{Amt. of liquid + Amt. of vapour}} = \frac{4}{5} \Rightarrow x_B$ in vapour form $= 0.8$.

Correct option is (d).

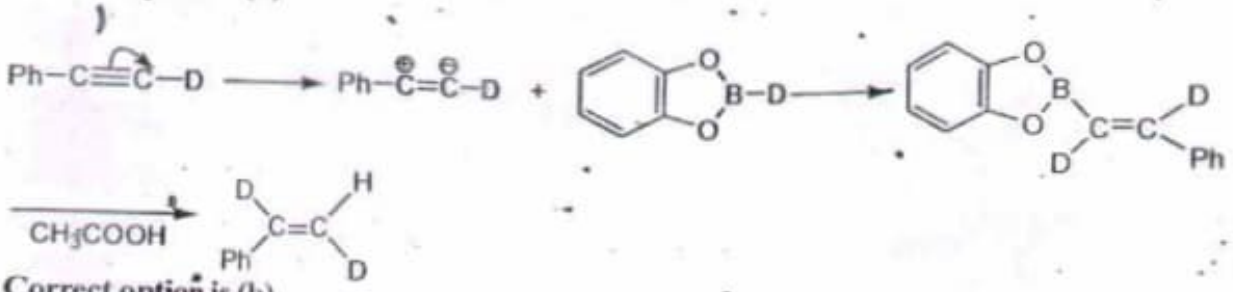
Solution for 51 and 52.



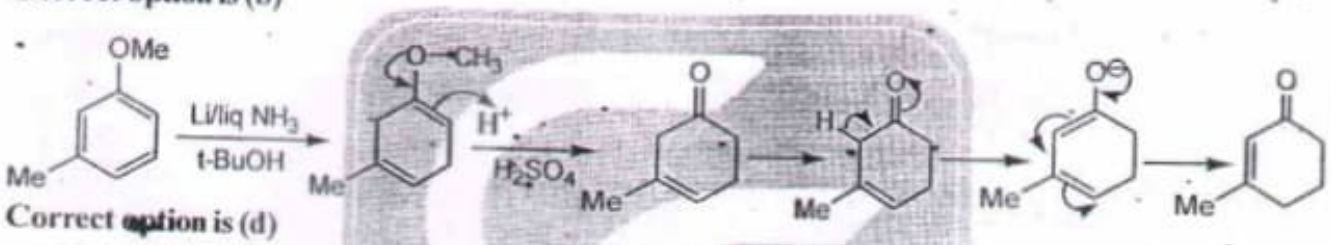
Hence Q.51, correct option is (a) and in Q.52, correct option is (a)

32. 

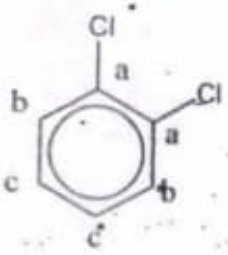
Correct option is (d)

33. 

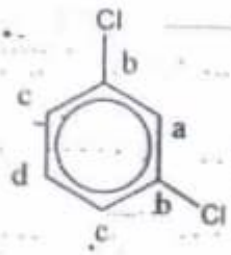
Correct option is (b)

34. 

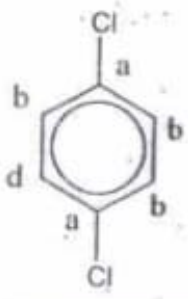
Correct option is (d)

35. 

3 signal in ^{13}CNMR



4 signal in ^{13}CNMR



2 signal in ^{13}CNMR

Correct option is (a)

$B = 18 \times n - TVE$

n = number of metal $= 18 \times 2 - 34 = 2$

$\frac{B}{2}$ = Number of M–M bond $= \frac{2}{2} = 1$

Correct option is (b)

6. In BaF_2 molecule, the coordination number Ba^{2+} is 8 and coordination number fluoride is 4.

Correct option is (b)

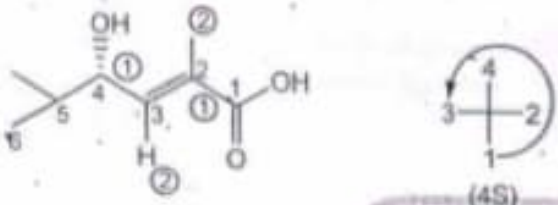
7. The transformation of oxyhaemoglobin to deoxyhaemoglobin Fe^{2+} involves change in low spin state to high spin state.

In deoxyhaemoglobin, Fe^{2+} is in high spin state.

In oxyhaemoglobin, iron of heme group bind with oxygen molecule, and Fe become low spin

Correct option is (a)

8.



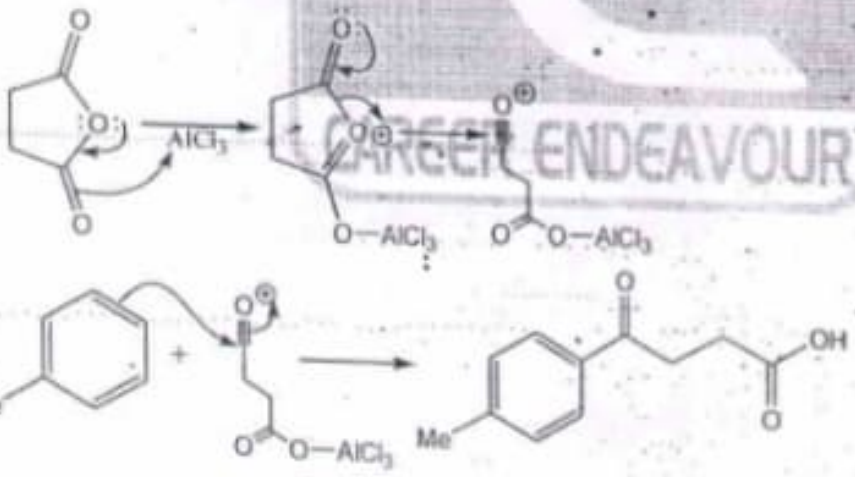
Correct option is (d)

9.

aromatic in nature containing charge seperation

Correct option is (a)

10.



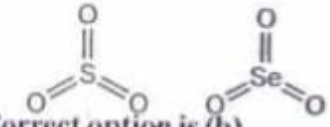
Correct option is (c)

25. $2d\sin\theta = n\lambda$; $3\times d\times \sin 15.87 = 1\times 1.54\times 10^{-8}\,cm$

$$d = \frac{1.54\times 10^{-8}\,cm}{2\times \sin 15.87} \quad d = \frac{1.54\times 10^{-8}\,cm}{2\times 0.27}$$

$$d = \frac{1154\times 10^{-8}\,cm}{154} = 2.85\times 10^{-8}\,cm = 2.85\times 10^{-8}\times 10^{-2}\,mtr = 2.85\times 10^{-10}\,mtr = 2.85\times \text{Å} = 2.85$$

Correct option is (b)

26. 

Planar

Correct option is (b)

27. Here, $\left[NiCl_2(PPh_3)_2\right]$ will be paramagnetic, whereas $\left[PdCl_2(PPh_3)_2\right]$ will be diamagnetic. Thus, magnetic susceptibility can be used to identify these compounds unambigously.

Hence, option (b) is correct.

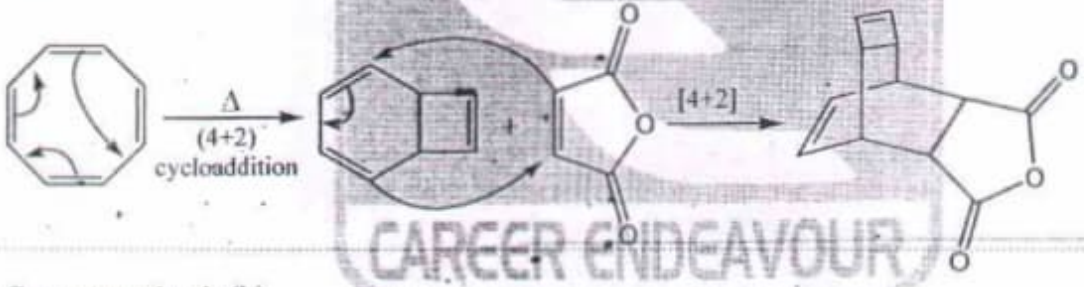
28. $HSO_4^-(aq) + OH^-(aq) \rightleftharpoons SO_4^{2-}(aq) + H_2O(aq)$

acid base conjugate base conjugate acid

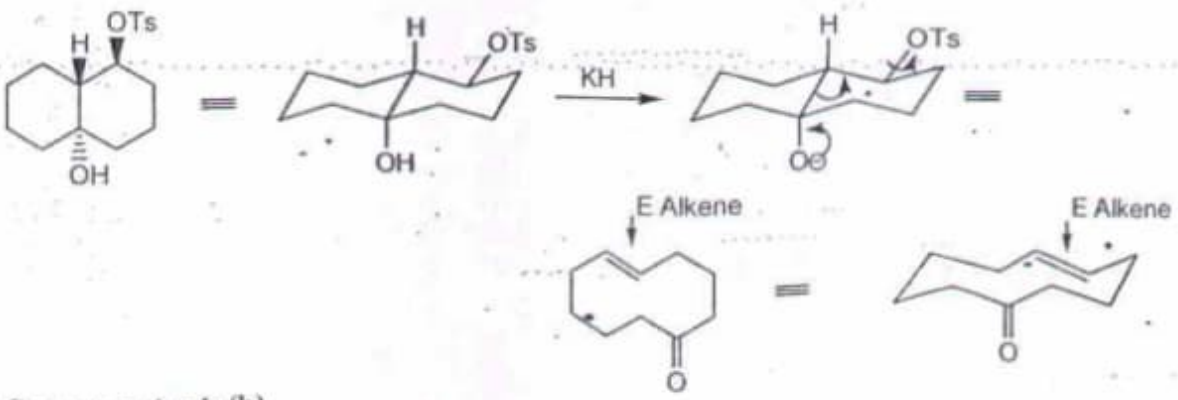
Correct option is (a)

29. $\left[Cr(C_2O_4)_3\right]^{3-}$ and $\left[V(H_2O)_6\right]^{2+}$ are inert orbital complexes. In both these complexes metal ion have d^3 configuration hence no low lying unhybrid vacant d-orbital. Hence, both are inert.

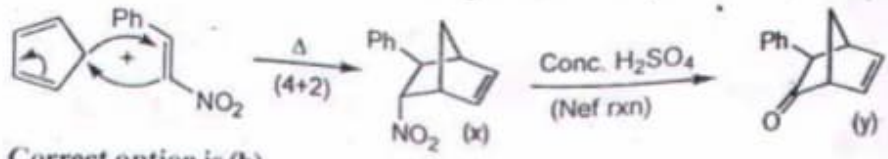
Correct option is (d)

30. 

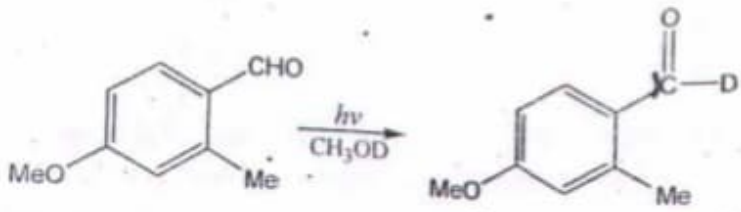
Correct option is (b)

31. 

Correct option is (b)

39. 

Correct option is (b)

40. 

The signal of –CHO proton disappear at **9.7 ppm**

Correct option is (a)

41. $t_{1/2} \propto \frac{1}{[A]_0^{n-1}} \Rightarrow \frac{240}{300} = \frac{(4)^{n-1}}{(5)^{n-1}}$

$$\left(\frac{4}{5}\right)^1 = \left(\frac{4}{5}\right)^{n-1} \Rightarrow n-1=1$$

$n = 2$ Order of reaction is 2

Correct option is (c)

42. $\tau = \frac{1}{K_F + K_{ISC} + K_{IC}} = 10\times10^{-9}\ \text{sec} \Rightarrow K_F + K_{ISC} + K_{IC} = 10^8\ s^{-1}$

$$\phi = \frac{K_F}{K_F + K_{ISC} + K_{IC}} = 0.1, \quad K_F = 0.1\times10^8 = 10^7\ s^{-1}$$

Correct option is (c)

43. For H_2, $\bar{v} = 4403.2\ cm^{-1}$; For I_2, $\bar{v} = 214.5\ cm^{-1}$, $T = 300K$

We know that, $\frac{n_2}{n_1} = \frac{g_2}{g_1} e^{-\Delta\varepsilon/kT}$

$$\frac{n_2}{n_1} = \frac{1}{1} e^{\frac{-hc\bar{v}}{kT}} \Rightarrow \frac{n_2}{n_1} = e^{\frac{hc\bar{v}}{kT}} \qquad \ldots (1)$$

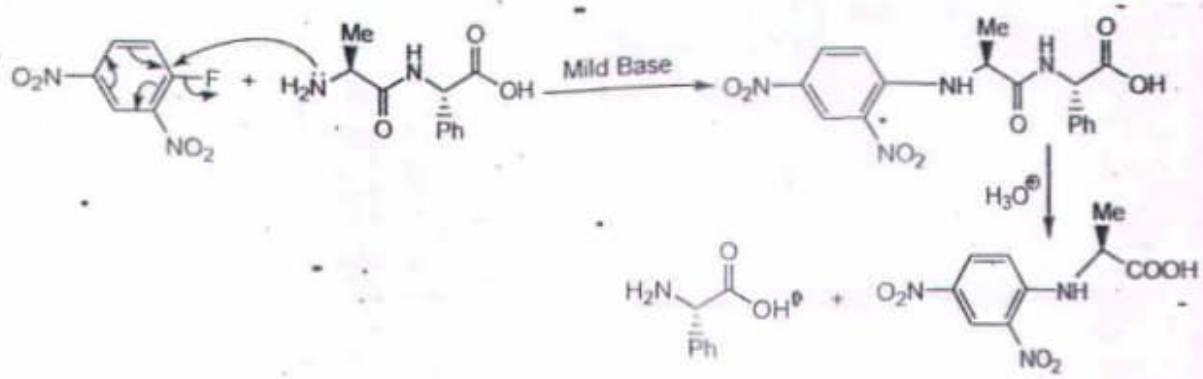
For H_2, $\frac{n_2}{n_1} = e^{\frac{6.626\times10^{-34}\ J\,sec\times3\times10^{10}\ cm/sec\times4403.2\ cm^{-1}}{1.38\times10^{-23}\ J/K\times300\ K}}$

$$= e^{-211.41\times10^{-3}} = e^{-21.14} = 6.75\times10^{-10} \simeq 7\times10^{-10}$$

For I_2, $\frac{n_2}{n_1} = e^{\frac{6.626\times10^{-34}\times3\times10^{10}\times214.5}{1.38\times10^{-23}\times300}} = e^{-10.29\times10^{-1}} = e^{-1.29} = 0.298 = 3\times10^{-1}$

Correct option is (b)

14.



Correct option is (a)

15. $q = \omega \cdot C_s \Delta T$

(a) $q = 200\, C_s (80-40)$

$q = 8000\, C_s$

(b) $q = 100\, C_s (80-20)$

$q = 6000\, C_s$

(c) $q = 150\, C_s (80-50)$

$q = 4500\, C_s$

(d) $q = 300\, C_s (80-30)$

$= 15000\, C_s$

Correct option is (c)

16. If $\Delta ng < 0 \Rightarrow$ decrease in entropy.

In option (a) $\Delta ng < 0$

Correct option is (a)

17. Sucrose(s) $\rightleftharpoons$ Sucrose (aq)

It is a non-reactive system.

Therefore, C = number of chemical constitute which is 2 here C = 2.

Correct option is (c).

18. Lowest energy equal to zero for a rigid rotor

$E = BJ(J+1) J = 0, 1, 23---$

$J = 0$

$E = B \times 0(0+1)$

$E = 0$

Correct option is (b)

19. $KCl \longrightarrow K^+ + Cl^-$

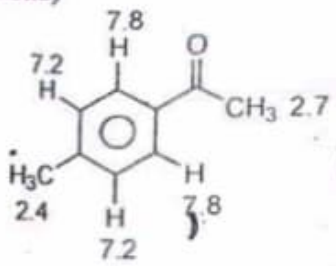
$\ln \gamma_{\pm} = -A|Z^+||Z^-|\sqrt{I}$; $\ln \gamma_{\pm} \propto \sqrt{4} \Rightarrow \ln \gamma_{\pm} = -2A|Z^+||Z^-|\sqrt{I}$

Decrease by factor 2

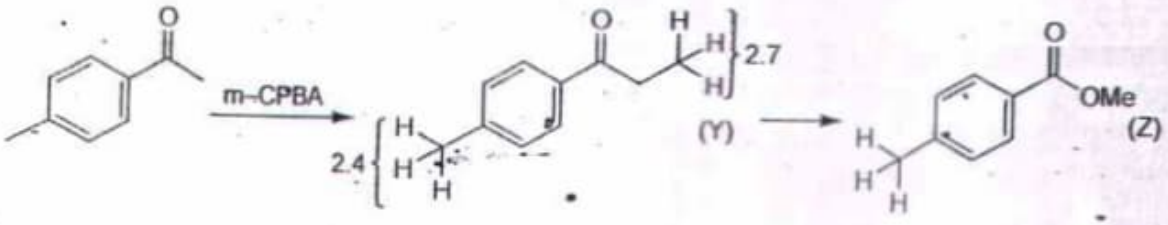
Correct option is (a)

DBE=$C_9H_{10}O$; $Cn-\frac{\text{monovalent}}{2}+1 \Rightarrow 9-\frac{10}{2}+1 \Rightarrow 9-\frac{5}{5}+1$

5(one ring + 4 double bond)

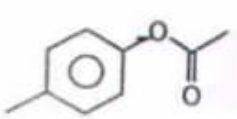


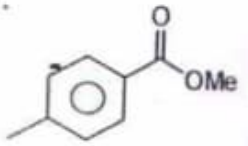
Compound (X)



Correct option is is (b)

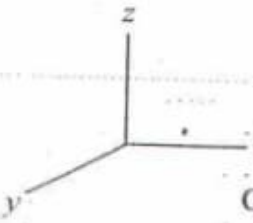
54.





Correct option is (b)

55.



Basis set = 3

Cartesian coordinate

C_{2v}	E	$C_2(z)$	σ_{xz}	σ_{yz}
x	1	−1	1	−1
y	1	−1	−1	1
z	1	1	1	1

C_{2v}	E	C_2	σ_{xz}	σ_{yz}
$R.R.$	3	−1	1	1

Correct option is (d)

44. $12h^2/8mℓ^2$ ——————— (222)

$11h^2/8mℓ^2$ ——————— n = (311) (131) (113)

$9h^2/8mℓ^2$ ——————— n = (221) (122) (212)

$6h^2/8mℓ^2$ ——————— n = (211) (121) (112)

$3h^2/8mℓ^2$ ——————— $n_x = 1, n_y = 1, n_z = 1$

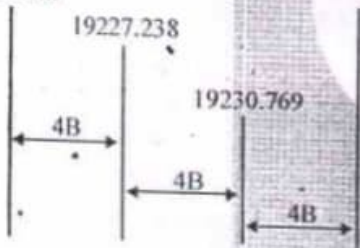
Ground state energy = (1 1 1) $= \dfrac{\left(n_x^2, n_y^2, n_z^2\right)h^2}{8mℓ^2} = \dfrac{3h^2}{8mℓ^2}$

4 times energy of ground state $= \dfrac{4\times 3h^2}{8mℓ^2} = \dfrac{12h^2}{8mℓ^2} = \dfrac{\left(n_x^2 n_y^2 n_z^2\right)h^2}{8mℓ^2} = \dfrac{\left(2^2+2^2+2^2\right)h^2}{8mℓ^2}$

$(n_x, n_y, n_z) = 2\,2\,2 \rightarrow$ degeneracy = 1

Correct option is (c)

45. 19223.707 cm^{-1}



$4B = 19230.769 - 19227.238$

$4B = 3.531$

$B = 88275\ cm^{-1}$

$B = 0.88275\ cm^{-1} \times c = 0.88275 \times \bar{c}m^{-1} \times 3\times 10^{10}$ cm/sec

$B = 26.484\times 10^9$ Hz = 26.484 GHz

46. $\lambda = \dfrac{h}{P}; \lambda = \dfrac{h}{mv}$

$\lambda = \dfrac{6.63\times 10^{-34}\ J.S}{4\times 6.023\times 10^{23}\times 1000\ m/s} \Rightarrow \lambda = \dfrac{6.63\times 10^{-34}}{4\times 6.023\times 10^{25}}\ m \Rightarrow \lambda = \dfrac{6.63}{24.092}$

$\lambda = \dfrac{6.63\times 10^{-34}\ J.S}{4\times 1.67\times 10^{-27}\times 1000}\ \dfrac{kg\,m}{S} = \dfrac{6.63\times 10^{-34}\times 10^{-24}}{4\times 1.67}$

$= \dfrac{6.63\times 10^{-10}}{6.68}\ m = 99.25\times 10^{-12}\ mtr = 0.99\times 10^{-10}\ m$

Correct option is (a)