CHEMISTRY-CY

Q.1 – Q.30 : Carry ONE mark each.

1. In units of $\frac{h^2}{8m\iota^2}$, the energy difference between levels corresponding to 3 and 2 node eigenfunctions for a particle of mass m in a one dimensional box of length ℓ is
(a) 1 (b) 3 (c) 5 (d) 7

2. On the basis o LCAO-MO theory, the magnetic characteristics of N_2 and N_2^+ are
(a) both diamagnetic (b) both paramagnetic
(c) N_2 dimagnetic and N_2^+ paramagnetic (d) N_2 paramagnetic and N_2^+ diamagnetic

3. The v_{rms} of a gas at 300 K is 30 $R^{1/2}$. The molar mass of the gas, in kg mol^{-1}, is
(a) 1.0 (b) 1.0×10^{-1} (c) 1.0×10^{-2} (d) 1.0×10^{-3}

4. The coefficient of performance of a perfect refrigerator working reversibly between the temperature T_c and T_h is given by
(a) $\frac{T_c - T_h}{T_c}$ (b) $\frac{T_h - T_c}{T_c}$ (c) $\frac{T_c}{T_h - T_c}$ (d) $\frac{T_h}{T_h - T_c}$

5. At a given temperature and pressure, the phase diagram of a three component system shows a binodal curve. if the two components are chloroform and water, the third component, among the choices given below, is
(a) benzene (b) acetic acid (c) toluene (d) carbon tetrachloride

6. A certain reaction proceeds in a sequence of three elementary steps with the rate constants k_1, k_2 and k_3. If the observed rate constant (k_{obs}) of the reaction is expressed as $k_{obs} = k_3(k_1/k_2)^{1/2}$, the observed activation energy (E_{obs}) of the reaction is
(a) $\frac{1}{2}\left[\frac{E_1}{E_2}\right]+E_3$ (b) $\frac{E_3+E_1}{E_2}$ (c) $E_3\left[\frac{E_1}{E_2}\right]^{1/2}$ (d) $E_3+\frac{1}{2}(E_1-E_2)$

7. Which one of the following is an example of a maximum boiling azeotrope?
(a) H_2O—HCl (b) H_2O—C_2H_6OH (c) $CHCl_3$—CH_3OH (d) CCl_4—CH_3OH

8. For the reaction, $A + B \rightleftharpoons X^+ \rightarrow P$, $Ea = 20.0$ kJ mol^{-1} at 300 K. The enthalpy change for the formation of the activated complex from the reactants in kJ mol^{-1} is
(a) 12 (b) 15 (c) 23 (d) 25

9. In an osmotic pressure measurement, a plot of height of solution (h) of density (ρ) versus concentration (gL^{-1}) was made at a temperature T. The slope of the plot will be equal to (where g, given in the choices below, is the acceleration of free fall)
(a) $\frac{\rho RT}{gM}$ (b) $\frac{gRT}{\rho M}$ (c) $\frac{RT}{\rho gM}$ (d) $\frac{gRM}{\rho T}$

10. If 0.001 M of a substance quenches the efficiency of fluorescence by 20%, the value of Stem-Volmer constant in M^{-1} is
(a) 100 (b) 150 (c) 200 (d) 250

11. Which one of the following is NOT a photodetector?
(a) Bolometer
(b) Charge-transfer device
(c) Photomultiplier tube
(d) Silicon diode

12. The nature of excitation signal used for cyclic voltametry is
(a) linear scan
(b) differential pulse
(c) triangular
(d) square wave

13. The structure of SF_4 is
(a) octahedral
(b) tetrahedral
(c) trigonal bipyramidal
(d) square planar

14. The number of metal-metal bonds present in $Ir_4(CO)_{12}$ are
(a) 4
(b) 5
(c) 6
(d) 8

15. The zero magnetic moment of octahedral K_2NiF_6 is due to
(a) low spin $d^6 Ni(IV)$ complex
(b) low spin $d^8 Ni(II)$ complex.
(c) high spin $d^8 Ni(II)$ complex
(d) high spin $d^6 Ni(IV)$ complex.

16. The number of hyperfine split lines observed in ESR spectrum of methyl radical is
(a) 1
(b) 4
(c) 6
(d) 8

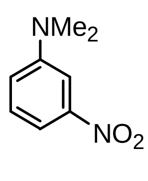
17. The absorption of $Co(NH_3)_6^{2+}$ is:
(a) stronger than that of $[Co(NH_3)_5 Cl]^{2+}$
(b) stronger than that of $[MnCl_4]^{2-}$
(c) weaker than that of $[MnCl_4]^{2-}$ but stronger than that of $[CO(NH_3)_5 Cl]^{2+}$
(d) weaker than those of both $[MnCl_4]^{2-}$ and $[Co(NH_3)_5 Cl]^{2+}$

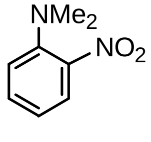
18. Which one of the following statements about ferrocene is FALSE?
(a) It obeys the 18-electron rule
(b) It is diamagnetic
(c) It is an orange solid
(d) It resists electrophilic substitution

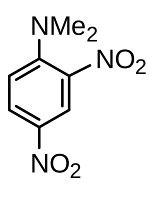
19. The bond angle of Cl_2O is
(a) smaller than that of F_3O
(b) greater than that of H_2O
(c) smaller than that of H_2O
(d) same as that of F_2O

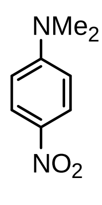
20. The half-wave potential for a reversible reduction of a metal ion in polarography is independent of
(a) Concentration of the supporting electrolyte
(b) Concentration of the electroactive species.
(c) Concentration of the complexing agent.
(d) Temperature of the solution.

21. The major product formed on nitration of N, N-dimethylaniline with conc. $H_2SO_4HNO_3$ mixture is

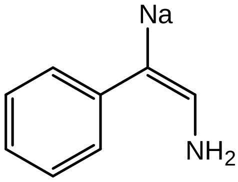
(a) 

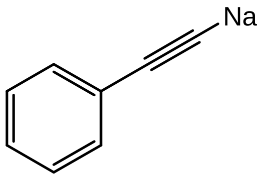
(b) 

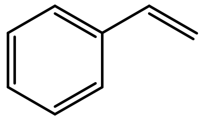
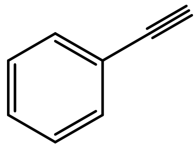
(c) 

(d) 

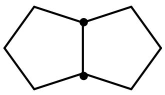
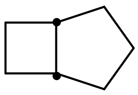
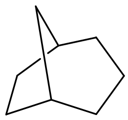
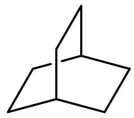
22. Reaction of phenylacetylene with sodamide in liquid ammonia generates

(a) 

(b) 

(c) 
(d) 

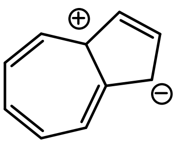
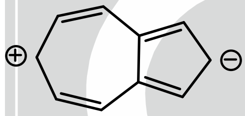
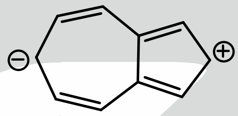
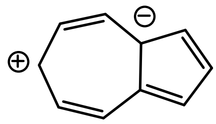
23. Proton decoupled ^{13}C NMR spectrum of a bicyclooctane (C_8H_{14}) exhibits only two signals. The Structure of the compound is:

(a) 
(b) 
(c) 
(d) 

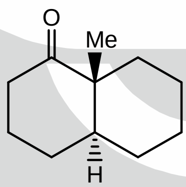
24. Cyclohexyl benzyl ether when reacted with hydrogen in the presence of 10% palladium on charcoal generates a mixture of
(a) cyclohexanol and benzyl alcohol (b) cyclohexane and benzyl alcohol
(c) cyclohexanol and toluene (d) cyclohexane and toluene

25. In electrophilic aromatic substitution reactions, nitro group is meta-directing, because the nitro group
(a) increase electron density at meta-position (b) increase electron density at ortho-and para-positions
(c) decreases electron density at meta-position (d) decreases electron density at ortho-and para-positions

26. Among the resonance forms given below, the one which contributes most to the stability of azulene is

(a) 
(b) 
(c) 
(d) 

27. The configurations at the two asymmetric centres (C–1 and C–6) in the bicyclo [4.4.0] decane, given below are

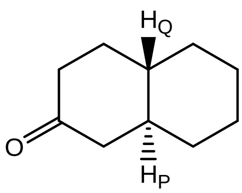


(a) 1R, 6R (b) 1R, 6S (c) 1S, 6S (d) 1S, 6R

28. The reactive intermediate involved in the conversion of phenol to salicylaldehyde using chloroform and sodium hydroxide is
(a) Cl_2C: (b) Cl_2CH^+ (c) Cl_2CH^- (d) Cl_2CH^+

29. Conversion of Ph-NH_2 into Ph-CN can be accomplished by
(a) reaction with sodium cyanide in the presence of nickel catalyst
(b) reaction with chloroform and sodium hydroxide
(c) diazotisation followed by reaction with CuCN
(d) reaction with ethyl formate followed by thermolysis

30. The vicinal coupling constant J expected for the protons H_P and H_Q in the compound given below will be in the range



(a) 0–2 Hz (b) 4–6 Hz (c) 8–10 Hz (d) 12–15 Hz

Q.31 – Q.90 : Carry TWO marks each.

31. For one mole of an ideal gas $\left(\frac{\partial P}{\partial T}\right)_V \left(\frac{\partial V}{\partial T}\right)_P \left(\frac{\partial V}{\partial P}\right)_T =$

(a) -1 (b) $-\frac{R^2}{P^2}$ (c) $+1$ (d) $\frac{R^2}{P^2}$

32. Neglecting the mass of hydrogen (1.0 amu) and deuterium (2.0 amu) with respect to that of iodine (127 amu), the ratio between fundamental vibrational frequencies of HI and DI is:

(a) $\frac{1}{2}$ (b) 2 (c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{2}$

33. The population of J^{th} rotational level N_j is given by $N_j = N_0(2J+1)e^{[j(j+1)B]/kT}$. The J value of rotational level with maximum population (J_{max}) is given by

(a) $\frac{(2k\,T/B)-1}{\sqrt{2}}$ (b) $\frac{\sqrt{2k\,T/B}-1}{2}$ (c) $\frac{kT}{B}$ (d) $\frac{B}{kT}$

34. The fugacity coefficient ϕ is given by $\ln\phi = \int_0^p \left(\frac{z-1}{p}\right) dp$ where z is the compressibility factor, and p the pressure. The fugacity of a gas governed by the gas law $p(V_m - b) = RT$ is

(a) $p\ln(V_m/RT)$ (b) $pe^{b/RT}$ (c) $pe^{-bp/RT}$ (d) $pe^{bp/RT}$

35. The number and symmetry type of normal modes of vibration of H_2O are
(a) 3 and $2A_1 + B_2$
(b) 3 and $2A_1 + A_2$
(c) 3 and $2A_1 + B_1$
(d) 4 and $3A_1 + B_2$

36. The gaseous reaction $2A + B \rightarrow C$, with partial pressures of $p_A = 0.1$ atm; $p_B = 0.001$ atm and $p_C = 1.0$ atm, proceeds to the left at 298 K. The equilibrium constant, K_p for the above reaction is

(a) 1.0×10^4 (b) 1.0×10^5 (c) 1.0×10^6 (d) 1×10^7

37. The change in entropy when one mole of an ideal gas is compressed to one-fourth of its initial volume and simultaneously heated to twice its initial temperature is

(a) $(C_v - R)\ln 4$ (b) $(C_v - 2R)\ln 2$ (c) $(C_v - 2R)\ln 4$ (d) $(C_v + 2R)\ln 2$

38. For the reaction, $A(s) \rightleftharpoons B(l) + 2C(g)$, $\Delta G^o\,(\text{in Joules}) = 90800 - 100T$. The partial pressure of C(g) at 600 K in Torr is
(a) 15 (b) 22 (c) 35 (d) 46

39. Match the following:

P. $\left(\frac{\partial U}{\partial S}\right)_V$ I. A

Q. $\left(\frac{\partial U}{\partial V}\right)_S$ II. –S

R. $\left(\frac{\partial G}{\partial P}\right)_T$ III. T

S. $\left(\frac{\partial G}{\partial T}\right)_P$ IV. –P

V. H

VI. V

(a) P-III Q-IV R-VI S-II (b) P-III Q-I R-II S-V

(c) P-I Q-III R-V S-II (d) P-IV Q-III R-VI S-V

40. Match the following :

P. 4n + 2 rule	I. Woodward-Hoffmann rule
Q. single valued	II. Bound system
R. $< p_x > = 0$	III. Hurtree-Fock Theory
S. photochemically allowed	IV. Huckel theory
	V. Wave function
	VI. unbound system

Codes:

(a) P-I, Q-III, R-IV, S-VI (b) P-IV, Q-V, R-II, S-VI

(c) P-II, Q-VI, R-III, S-I (d) P-IV, Q-V, R-II, S-I

41. The solubility product of silver sulphate at 298 K is 1.0×10^{-5}. If the standard reduction potential of the half-cell $Ag^+ + e \rightarrow Ag$ is 0.80 V, the standard reduction potential of the half-cell $Ag_2SO_4 + 2e \rightarrow 2Ag + SO_4^{2-}$ is:

(a) 0.15 V (b) 0.22 V (c) 0.65 V (d) 0.95 V

42. The criterion for spontaneous change in terms of the state functions is:

(a) $dU_{S,V} \geq 0$ (b) $dA_{T,V} \geq 0$ (c) $dS_{U,V} \geq 0$ (d) $dG_{T,V} \leq 0$

43. One mole of an ideal gas $(C_V = 1.5\,R)$ at a temperature 500 K is compressed from 1.0 atm to 2.0 atm by a reversible isothermal path. Subsequently, it is expanded back to 1.0 atm by a reversible adiabatic path. The volume of the final state in litre is:

(a) 15.6 (b) 20.5 (c) 31.1 (d) 41.0

44. The vapour pressures of the pure components P and Q are 700 Torr and 500 Torr, respectively. When the two phases are in equilibrium at 1.0 atm, the mole fraction of P in the liquid phase is 0.6 and in the vapour phase 0.4. The activity co-efficient of component P in the solution on the basis of Raoult's law is

(a) 0.60 (b) 0.72 (c) 0.92 (d) 1.01

45. The concentration of oxygen in water in mg L^{-1}. If the Henry's law constant for oxygen at 298 K is 2.80×10^7 Torr, the partial pressure of oxygen in the atmosphere in Torr is,

(a) 28 (b) 32 (c) 50 (d) 15.68

46. Decomposition of ammonia on tungsten at 850ºC has a rate constant value of 0.10 Torr s^{-1}. If the initial pressure of ammonia is 100 Torr, the pressure of ammonia (in Torr) at t = 200 s is

(a) 10 (b) 20 (c) 50 (d) 80

47. For the reaction of the type $P \xrightarrow{k_1} Q \xrightarrow{k_2} R$, given that $[P]_0 = 1.0M; k_1 = 1\times10^{-3}\,s^{-1}$ and $k_2 = 1\times10^{-4}\,s^{-1}$, the time at which the concentrations of Q and R are 0.5966 M and 0.0355M, respectively, is

(a) 500s (b) 750 s (c) 1000 s (d) 1500 s

48. The spinels $CoFe_2O_4$ and $FeFe_2O_4$, respectively, are

(a) inverse and inverse (b) inverse and normal (c) normal and normal (d) normal and inverse

49. According to Wade's rule, the structures of $B_{10}C_2H_{12}$ and $[B_9C_2H_{11}]^{2-}$, respectively, are

(a) closo and arachno (b) nido and closo (c) closo and nido (d) nido and arachno

50. The overall charge present on the cyclic silicate anion $\left[Si_6O_{18}\right]^{n-}$ is

(a) 6 (b) 12 (c) 18 (d) 24

51. The ground state term symbols for high spin d^5s^1 and d^5 configurations, respectively, are

(a) ^3S and ^6S (b) ^6P and ^3S (c) ^7S and ^6S (d) ^7P and ^6S

52. The reagents required for the synthesis of cyclic phosphazene $N_4P_4Cl_8$ are

(a) PCl_5 and NH_3
(b) $POCl_3$ and NH_4Cl
(c) $POCl_3$ and NH_3
(d) PCl_5 and NH_4Cl

53. The isomerisms that are possible in the Co(III) complexes $\left(Co\left(NH_3\right)_3\left(NO_2\right)_3\right)$ and $\left[Co\left(NH_3\right)_5 NO_2\right]Cl_2$, respectively, are

(a) co-ordination and position
(b) optical and linkage
(c) geometrical and linkage
(d) optical and optical.

54. The perxenate ion XeO_4^{4-} can be prepared by

(a) direct reaction of Xe with oxygen
(b) reaction of XeF_6 with oxygen
(c) hydrolysis of XeF_6 in acidic medium
(d) hydrolysis of XeF_6 in basic medium.

55. In tetrahedral geometry, which one of the following sets of electronic configurations will have orbital contribution to the magnetic moment?

(a) d^3, d^4, d^8 and d^9
(b) d^1, d^6, d^7 and d^9
(c) d^3, d^4, d^7 and d^9
(d) d^1, d^3, d^4 and d^9.

56. The most suitable route to prepare the trans isomer of $\left[PtCl_2\left(NH_3\right)\left(PPh_3\right)\right]$ is:

(a) $\left[PtCl_4\right]^{2-}$ with PPh_3 followed by reaction with NH_3.

(b) $\left[PtCl_4\right]^{2-}$ with NH_3 followed by reaction with PPh_3.

(c) $\left[Pt\left(NH_3\right)_4\right]^{2+}$ with HCl followed by reaction with PPh_3.

(d) $\left[Pt\left(NH_3\right)_4\right]^{2+}$ with PPh_3 followed by reaction with HCl.

57. A solution containing 5 ppm of $KMnO_4$ (F.W. = 159) has a transmittance of 0.360 measured in a 1 cm cell at 500 nm. The molar absorptivity of $KMnO_4$ in L mol^{-1} cm^{-1} is

(a) 1.1×10^4 (b) 1.4×10^4 (c) 1.9×10^4 (d) 2.7×10^4

58. Match the following:

P. Coulometry	I. Dropping mercury electrode
Q. Ion selective electrode	II. Current efficiency
R. Polarography	III. Dead stop end point
S. Amperometry	IV. Membrane potential
	V. Conductometer
	VI. Actinometer.

(a) P-II, Q-IV, R-I, S-III
(b) P-I, Q-II, R-III, S-V
(c) P-VI, Q-V, R-III, S-IV
(d) P-III, Q-IV, R-I, S-VI

59. Match the following :

P: Ferritin	I. electron transport
Q : Vitamin B_{12}	II. Ionophore
R : Cytochromes	III. Oxygen transport
S : Valinomycin	IV. Nitrogen fixation
	V. Organometallic enzyme
	VI. Iron storage.

(a) P-VI	Q-IV	R-II	S-I
(b) P-I	Q-III	R-VI	S-IV
(c) P-III	Q-V	R-IV	S-VI
(d) P-VI	Q-V	R-I	S-II

60. The number of absorption bands observed $[FeF_6]^{3-}$ and $[CoF_6]^{3-}$, respectively, are

(a) 1 and 3 (b) 0 and 1 (c) 0 and 3 (d) 3 and 1

61. Regarding the catalytic cycle of hydrogenation of alkenes involving $RhCl(PPh_3)_3$ as the catalyst, the correct statements is:
(a) Only 18-electron Rh complex is involved.
(b) 14-, 16- and 18-electron Rh complexes are involved.
(c) 14- and 16-electron Rh complexes are involved.
(d) 16- and 18-electron Rh complexes are involved.

62. The infra-red stretching frequency V_{CO} of P–S follows the order

(P) $Mn(CO)_6^+$ (Q) CO (R) $H_3B \leftarrow CO$ (S) $\left[V(CO)_6\right]^-$
(a) P > R > S > Q (b) S > P > R > Q
(c) Q > S > P > R (d) R > Q > P > S

63. The structures of $N(CH_3)_3$ and $N(SiH_3)_3$, respectively, are
(a) trigonal planar and pyramidal (b) pyramidal and trigonal planar
(c) pyramidal and pyramidal (d) trigonal planar and trigonal planar

64. Which one of the following is NOT correct in chromatography ?

t_M = Retention time for a species that is not retained by the stationery phase.

T_R = Retention time for the analyte

$(t_R)_n$ = Retention time for the component n

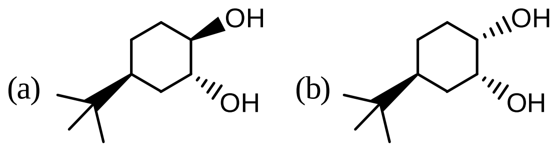
W_n = Width of the peak at its base for the component n

(a) Resolution $= \dfrac{(t_R)_2 - (t_R)_1}{2(W_1 + W_2)}$ (b) Capacity factor $= \dfrac{t_R - t_M}{t_M}$

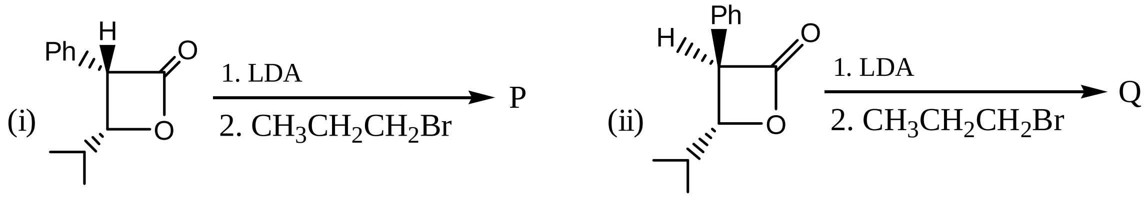
(c) Separation factor $= \dfrac{(t_R)_2 - t_M}{(t_R)_1 - t_M}$ (d) No. of theoretical plates $= 16\left(\dfrac{t_R}{W}\right)^2$

65. Thermal reaction of allyl phenyl ether generates a mixture of ortho-and para-allyl phenols. The para-allyl phenol is formed via
(a) a[3, 5]-sigmatropic shift
(b) first ortho-allyl phenol is formed, which then undergoes a [3, 3]-sigmatropic shift
(c) two consecutive [3, 3]-sigmatropic shifts
(d) dissociation to generate allyl cation, which then adds at para-position

66. Of the favour vicinal diols shown below, only three are cleaved by HIO_4, the diol which is NOT cleaved HIO_4 is



67. With respect to the two reactions shown below, the correct statements about their stereochemical nature is [LDA=LiN(^{i}Pr$_2$)]

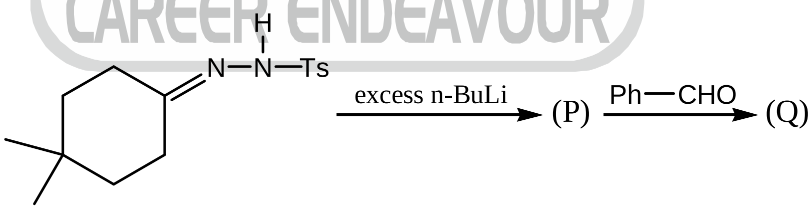


(a) The reactions are stereoselective, because P and Q are the same.
(b) The reactions are non-stereoselective, because P and Q are the same.
(c) The reactions are stereoselective, because P and Q are diastereomers.
(d) The reactions are enantioselective, because P and Q are enantiomers.

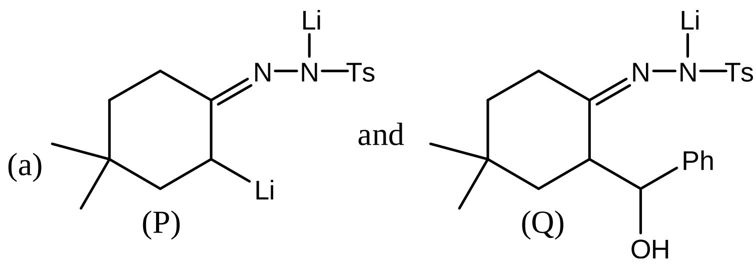
68. For the reactions shown below, identify the correct statement with regard to the products formed.

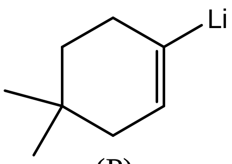
(a) P and Q are identical, both are optically active.
(b) P and Q are positional isomers, P is racemic and Q is optically active.
(c) P and Q are positional isomers, P is optically active and Q is racemic.
(d) P and Q are positional isomers, both are optically active.

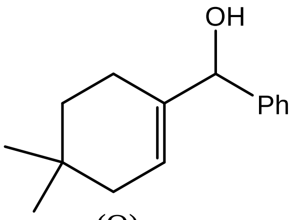
69. In the reaction shown below, identify the correct combination of the intermediate P and the product Q.



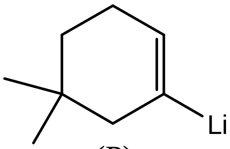
(Ts = 4-methylphenylsulfonyl)

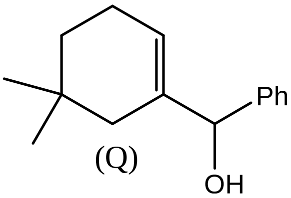


(b) 

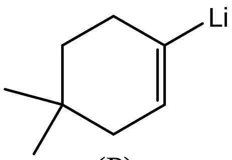
(P)
and 

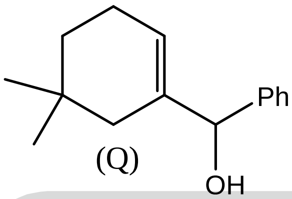
(Q)

(c) 

(P)
and 

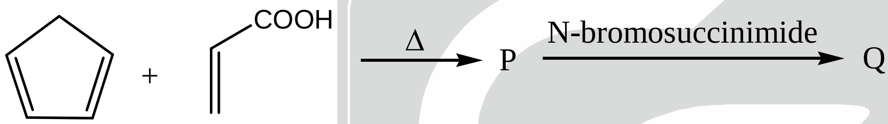
(Q)

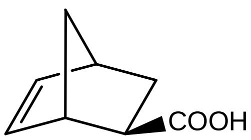
(d) 

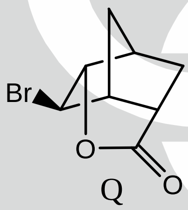
(P)
and 

(Q)

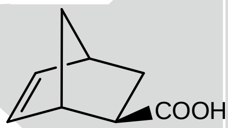
70. In the two step reaction shown below, identify the correct combination of products P and Q.

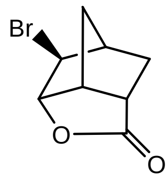


(a) 

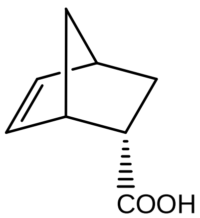
P
and 

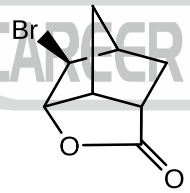
Q

(b) 

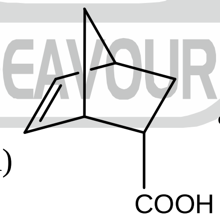
P
and 

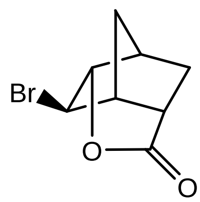
Q

(c) 

P
and 

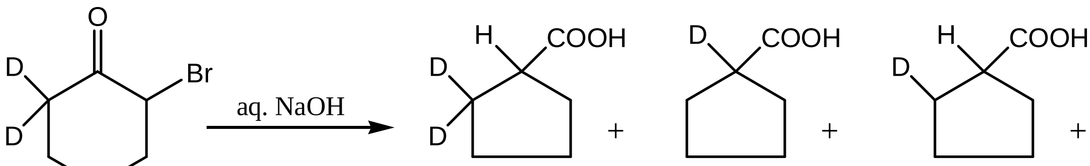
Q

(d) 

P
and 

Q

71. On the basis of Favorskii rearrangement mechanism, the ratio of the products P, Q and R given below, will be, respectively.

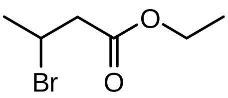


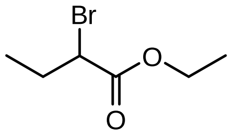
(P) (Q) (R)

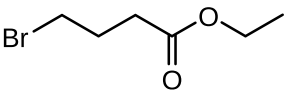
(a) 2 : 1 : 1 (b) 1 : 1 : 1 (c) 1 : 0 : 1 (d) 0 : 1 : 1

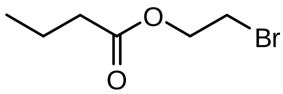
72. An organic compound having molecular formula $C_6H_{11}BrO_2$ exhibits the following peaks in ^{1}H NMR spectrum. δ $4.1(2H, q, J = 7.5\ Hz)$, $4.0(2H, t, J = 7.5\ Hz)$, $1.5-2.2(4H, m)$, $1.25(3H, t, J = 7.5\ Hz)$

The structure of the compound is:

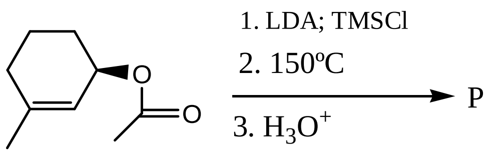
(a) 

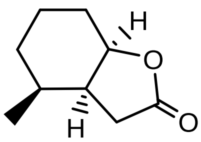
(b) 

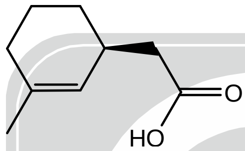
(c) 

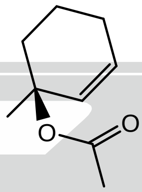
(d) 

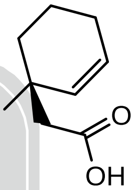
73. The product P formed in the following three steps reaction is:



(a) 

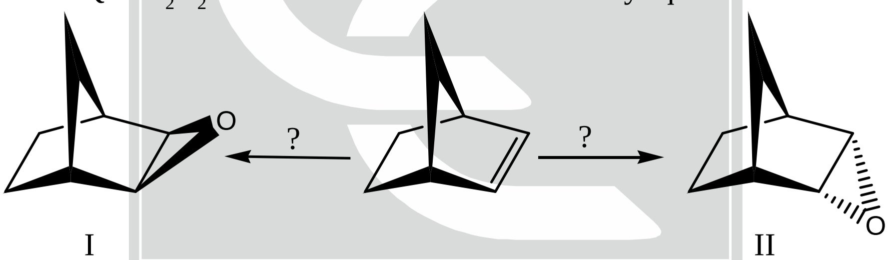
(b) 

(c) 

(d) 

74. Identify the correct choice of reagents, among P, Q and R, for the transformation of norbornene into the epoxides I and II

P=H_2O_2–AcOH   Q = H_2O_2–NaOH   R=HOBr followed by aq. NaOH.

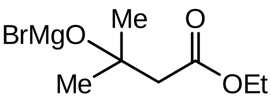


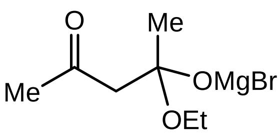
I   II

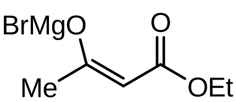
(a) P gives I and Q gives II   (b) R gives I and P gives II

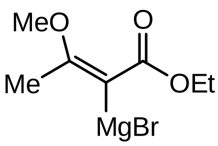
(c) Q gives I and R gives II   (d) P gives I and R gives II

75. Reaction of ethyl acetoacetate with one equivalent of methylmagnesium bromide gives

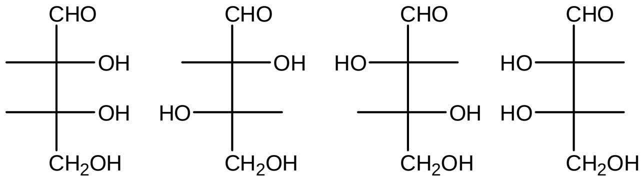
(a) 

(b) 

(c) 

(d) 

76. For the aldotetroses I-IV, the combination of TRUE statements, among P-T, is:



I II III IV

P=I and II are diastereomers and II and III are enantiomers.
Q=I and IV are mesomers and are optically inactive.
R=I and III can be interconverted by a base catalysed isomerisation.
S=only I and IV are HIO_4 cleavable.
T=I and III are D-sugars and II and IV are L-sugars.

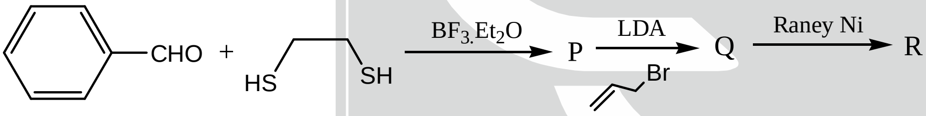
(a) Q, R, T (b) P, R, T (c) Q, S, T (d) P, Q, S

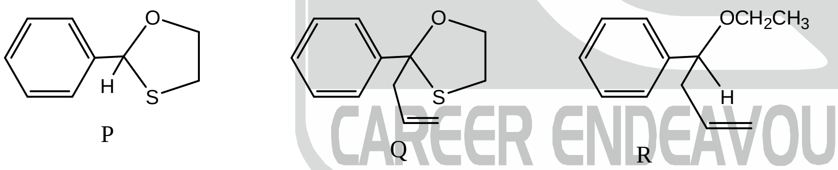
77. Match the compounds P-S with their carbonyl stretching frequencies (cm^{-1}) I–VI in IR spectroscopy.

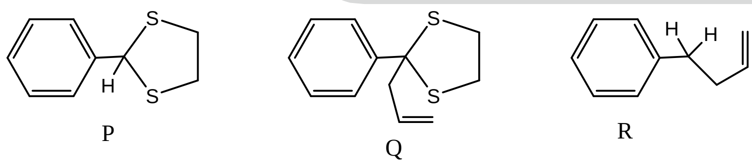
P. acetone	I. 1870
Q. ethyl acetate	II. 1800
R. acetamide	III. 1740
S. acetyl chloride	IV. 1700
	V. 1660
	VI. 1600

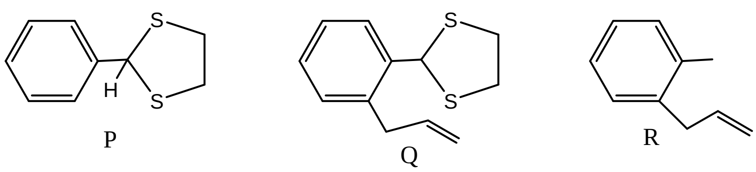
(a) P-IV, Q-III, R-I, S-VI (b) P-III, Q-VI, R-V, S-II
(c) P-IV, Q-III, R-V, S-II (d) P-II, Q-V, R-III, S-VI

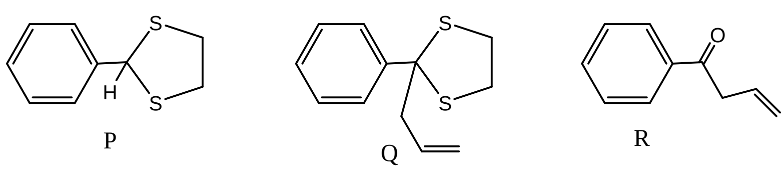
78. In the following three step transformation, identify the correct combination of product P, Q and R. [LDA=LiN(^{i}Pr)$_2$].



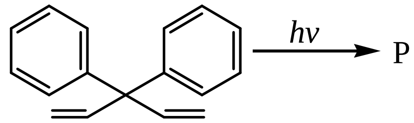
(a)


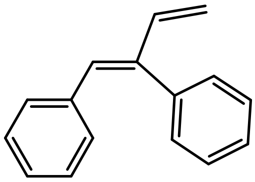
(b)


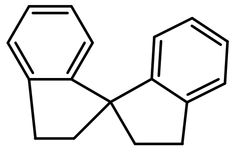
(c)


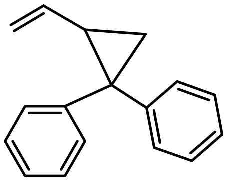
(d)


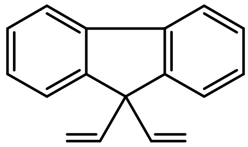
79. The major product P formed in the following photochemical reaction is:



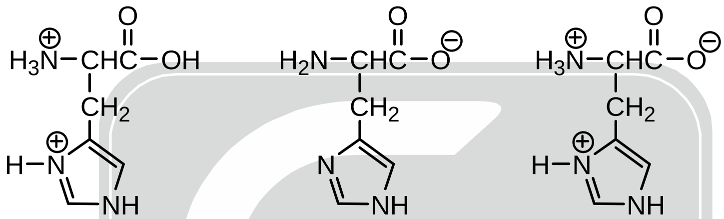
(a) 

(b) 

(c) 

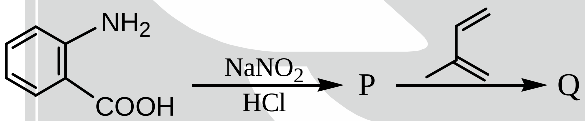
(d) 

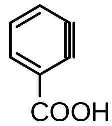
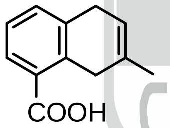
80. Three molecular ionic states, P-R, are possible for the amino acid histidine. Identify the correct choice of pH values, respectively, for the observation of the ionic states P-R.

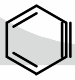
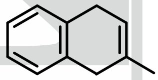


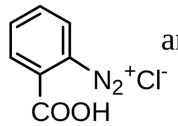
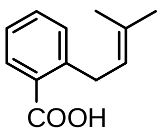
(a) P at pH 1; Q at pH 12 ; R at pH 7
(b) P at pH 7; Q at pH 1; R at pH 12
(c) P at pH 12; Q at pH 7; R at pH 1
(d) P at pH 12; Q at pH 1; R at pH 7

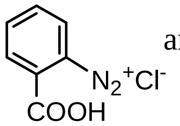
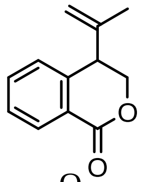
81. In the reaction shown below, identify the correct combination of the intermediate P and the product Q.



(a)  P and  Q

(b)  P and  Q

(c)  P and  Q

(d)  P and  Q

82. – 90. contain a Statement with a Reason and an Assertion. for each question, choose the correct answer from the following four choices.

(a) Both Reason and Assertion are correct
(b) Both reason and Assertion are wrong
(c) Reason is correct and Assertion is wrong
(d) Reason is wrong but Assertion is correct

82. **Statement :** solid carbon dioxide is called as dry ice.
Reason : CO_2 sublimes when kept in open atmosphere.
Assertion : Triple point of CO_2 lies above one atmosphere.

83. **Statement :** Entropy of pure, perfectly crystalline substance is zero at absolute zero of temperature.
Reason : At absolute zero, molecules can have only one orientation.
Assertion : Statistical definition of entropy is given by the equation, S = k ln W, where W is the probability of orientation

84. **Statement :** Catalytic decomposition of ammonia on platinum takes place at 1000ºC.
Reason : Ammonia is more strongly adsorbed than hydrogen on platinum.
Assertion : The rate law for the decomposition of ammonia on platinum is given as, $\text{Rate} = k\frac{p_{NH_3}}{p_{H_2}}$.

85. **Statement :** $CoCl_4^{2-}$ is a regular tetrahedron but $CuCl_4^{2-}$ is a distorted tetrahedron.
Reason : Unsymmetrical distribution of electrons in e_g orbital leads to distortion in $CuCl_4^{2-}$.
Assertion : Cl^- ligands interact differently with orbitals of unequal electron population. This leads to distortion in tetrahedral geometry.

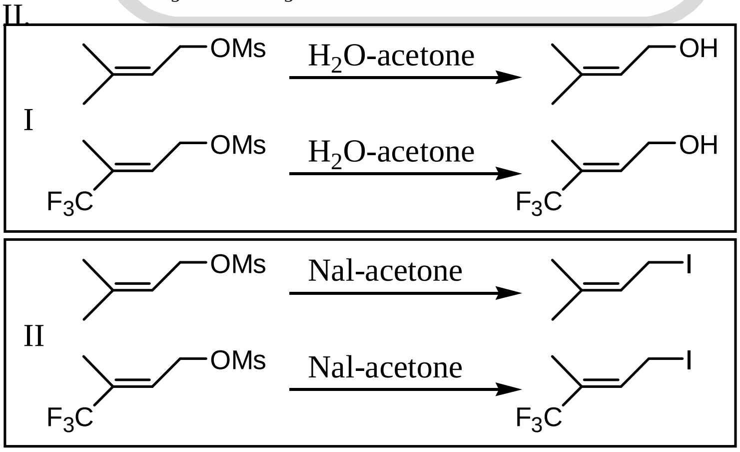
86. **Statement :** Schottky and Frenkel defects are stoichiometric defect occurring in crystal lattices.
Reason : Schottky defects are due to the absence of one positive and one negative ion and Frenkel defects are due to the presence of one hole and one ion in an interstitial position.
Assertion : The ratio of number of atoms of one kind to the number of atoms of the other kind does not correspond exactly to the ideal whole number ratio implied by the formula which leads to stoichiometric defects.

87. **Statement :** Ga is below Al in Group IIIA, yet the atomic size of Ga is almost the same as that of Al.
Reason : Lanthanide contraction
Assertion : Poor shielding of nuclear charge results in outer electrons being more firmly held by the nucleus.

88. **Statement:** 5-Bromopyrimidine ($C_4H_3BrN_2$) exhibits two prominent peaks in the mass spectrum at m/z 158 and 160 in the ratio of 1:1.
Reason: There are two basic centres in the molecule, which are protonated.
Assertion: There are two isotopes of bromine, ^{79}Br and ^{81}Br, that occur in the ratio of 1:1.
Choose the correct answer from the following four choices.
(a) Both Reason and Assertion are correct.
(b) Both Reason and Assertion are wrong
(c) Reason is correct and Assertion is wrong.
(d) Reason is wrong but Assertion is correct.

89. **Statement :** Pyridine is more basic than pyrrole.
Reason : The nitrogen in pyrrole carries a proton while the nitrogen in pyridine does not.
Assertion : Nitrogens in trigonal geometry are generally more basic than the nitrogens in tetrahedral geometry.

90. **Statement :** Replacement of CH_3 with CF_3 decreases the rate decreases the rate of reaction I, but increases the rate of reaction II.



Reason : Reaction I proceeds through SN_1 mechanism and reaction II proceeds through SN_2 mechanism.
Assertion : Being an electron withdrawing group, CF_3 destabilizes the transition state in SN_1 reaction, but stabilizes the transition state in SN_2 reaction.

***** END OF THE QUESTION PAPER *****