GATE-CY 2005

Section-A

Q.1 – Q.30 : Carry ONE mark each.

1. The complexes $\left[Co\left(NH_3\right)_4\left(H_2O\right)Cl\right]Br_2$ and $\left[Co\left(NH_3\right)_4Br_2\right]Cl.H_2O$ are examples of

(a) ionization isomerism (b) linkage isomerism

(c) geometric isomerism (d) optical isomerism

2. In the trigonal bipyramidal crystal field, the d orbital with the highest energy is

(a) d_{xy} (b) $d_{x^2-y^2}$ (c) d_{yz} (d) d_{z^2}

3. The magnetic moment of the complex $K_3\left[CoF_6\right]$ is 5.0 μ_B. The total stabilization energy will be

(a) $-0.4\,\Delta_0$ (b) $-0.4\,\Delta_0+P$ (c) $-2.4\,\Delta_0+3P$ (d) $-1.8\,\Delta_0+3P$

4. The metal present at the active site of the protein carboxypeptidase A is

(a) Zinc (b) molybdenum (c) magnesium (d) cobalt

5. The neutral complex which follows the 18-electron rule is

(a) $\left(\eta^5-C_5H_5\right)Fe\left(CO\right)_2$ (b) $\left(\eta^5-C_5H_5\right)Mo\left(CO\right)_3$

(c) $\left(\eta^5-C_5H_5\right)_2CO$ (d) $\left(\eta^5-C_5H_5\right)Re\left(\eta^6-C_6H_6\right)$

6. The shape of the molecule XeO_2F_2 is

(a) distorted tetrahedral (b) square planar

(c) trigonal bipyramidal (d) tetrahedral

7. Triplet superphosphate is made by treating phosphate rock with

(a) conc. H_2SO_4 (b) conc. HNO_3 (c) conc. HCl (d) conc. H_3PO_4

8. The number of hydroxy (OH) groups present in phosphorus acid is

(a) one (b) two (c) three (d) four

9. Out of the following, the one which is not an excitation source for IR spectrometer is

(a) Tungsten filament lamp (b) Nernst glower

(c) Deuterium lamp (d) Mercury arc

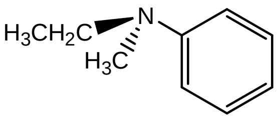
10. One of the following is not related to polarography

(a) limiting current (b) diffusion current constant

(c) Ilkovic equation (d) current efficiency

11. Among the following, the optically inactive compound is:

(a)



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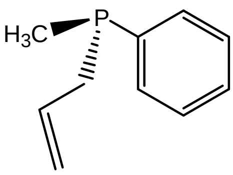
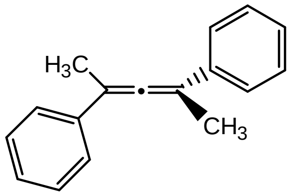
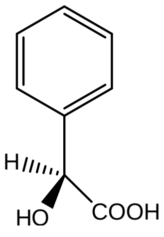


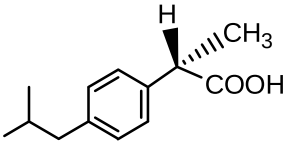
(c)



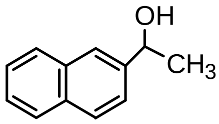
(d)



12. Esterification of the acid P with the alcohols Q will give



(S)-P



(±)-Q

(a) only one enantiomer
(b) a mixture of diastereomers
(c) a mixture of enantiomers
(d) only one diastereomer

13. ^1H NMR spectrum of [18]-annulene shows

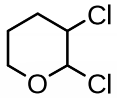
(a) Only one peak at $\delta\,7.2\,(18\text{ H})$

(b) Only one peak at $\delta\,5.0\,(18\text{ H})$

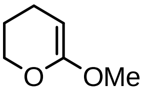
(c) Two peaks at $\delta\,9.0\,(12\text{ H})$ and δ-3.0(6 H)

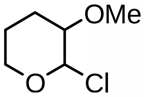
(d) Two peaks at $\delta\,9.0\,(6\text{ H})$ and δ-3.0(12 H)

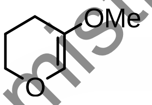
14. The compound formed on methanolysis of P is

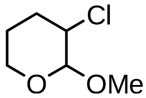


P

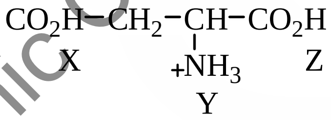
(a) 

(b) 

(c) 

(d) 

15. The pK_a values for the three ionizable groups X, Y and Z of glutamic acid are 4.3, 9.7 and 2.2 respectively



$$\underset{X}{CO_2H}-CH_2-\underset{\underset{Y}{^+NH_3}}{CH}-\underset{Z}{CO_2H}$$

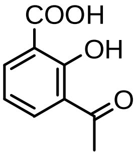
The isoelectric point for the amino acid is
(a) 7.00
(b) 3.25
(c) 4.95
(d) 5.95

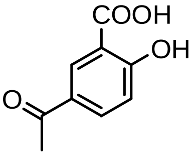
16. Bridge-head hydrogen of the conformer of cis-decalin is positioned as

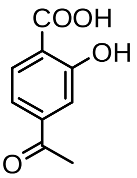
(a) a, a
(b) e, e
(c) a, e
(d) pseudo-a, pseudo-e

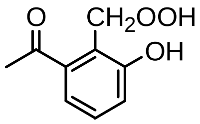
[a = axial; e = equatorial]

17. The major product of the acetylation of salicylic acid with Ac_2O/H^+ followed by heating with anhydrous $AlCl_3$ is

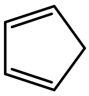
(a) 

(b) 

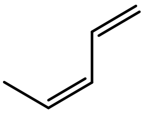
(c) 

(d) 

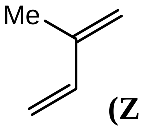
18. Order of reactivity of the following dienes X, Y and Z in Diels-Alder reaction is



(X)



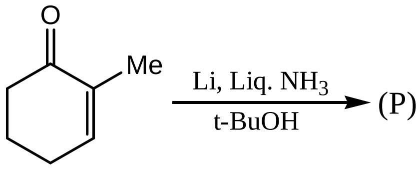
(Y)



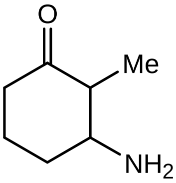
(Z)

(a) X > Z > Y
(b) Y > X > Z
(c) Y > Z > X
(d) X > Y > Z

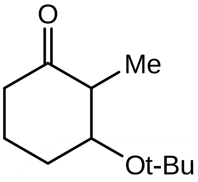
19. The major product P of the following reaction is



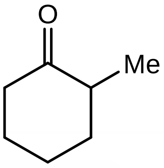
(a)



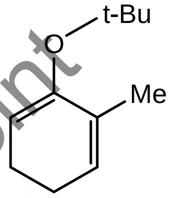
(b)



(c)

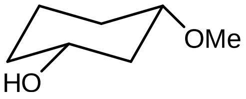


(d)

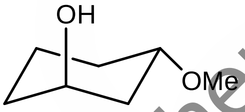


20. Among the following, the most stable isomer for 3-methoxycyclohexanol is:

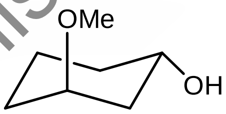
(a)



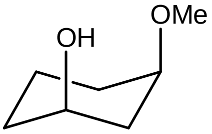
(b)



(c)



(d)



21. A reaction follows second order rate law, $-d[A]/dt = k[A]^2$, if

(a) a plot of [A] versus t is a straight line
(b) a plot of 1/[A] versus t is a straight line
(c) a plot of ln[A] versus t is a straight line
(d) a plot of $e^{[A]}$ versus t is a straight line

22. In an adiabatic system, the work done to change its state from A to B is

(a) dependent on path from A to B
(b) independent of path from A to B
(c) path dependence is related to particulars of states A and B
(d) path dependence is related to both states A and B and choice of path

23. The set of eigenfunctions $\sqrt{\frac{2}{a}}\sin\frac{n\pi x}{a}\left(0 \le x \le a,\ n = 1, 2, 3...\right)$ is

(a) orthogonal
(b) normalized
(c) both orthogonal and normalized
(d) unnormalized

24. The function e^{ax^2} $(\alpha > 0)$ is not an acceptable wave function for bound system, because

(a) it is not continuous
(b) it is multivalued
(c) it is not normalisable
(d) all of these

25. First order perturbation correction $\Delta\,\varepsilon_n^{(1)}$ to energy level ε_n of a simple harmonic oscillator due to the anharmonicity perturbation γx^3 is given by

(a) $\Delta\varepsilon_n^{(1)} = \gamma$
(b) $\Delta\varepsilon_n^{(1)} = \gamma^2$
(c) $\Delta\varepsilon_n^{(1)} = \gamma^{-1}$
(d) $\Delta\varepsilon_n^{(1)} = 0$

26. Resonant frequencies for EPR and NMR are respectively in the spectral region
(a) microwave and far-IR (b) far-IR and microwave
(c) radiofrequency and microwave (d) microwave and radiofrequency

27. The 2*s* orbital of H-atom has radial node at $2a_0$ because ψ_{2s} is proportional to

(a) $\left(\frac{1}{2}+\frac{r}{a_0}\right)$ (b) $\left(2+\frac{r}{a_0}\right)$ (c) $\left(2-\frac{r}{a_0}\right)$ (d) $\left(2-\frac{r}{2a_0}\right)$

28. Given that the mean speed of H_2 is 1.78 km s^{-1}, the mean speed of D_2 will be
(a) 1.26 km s^{-1} (b) 2.52 km s^{-1} (c) 5.04 km s^{-1} (d) 3.17 km s^{-1}.

29. The triple point for water is
(a) unique (b) depends on p but is independent of T
(c) depends on T but is independent of P (d) depends on both P and T

30. Hydrolysis of urea by urease is
(a) first order at high concentration of urea (b) zero order at high concentration of urea
(c) independent of the concentration of urea (d) first order with respect to both urea and urease

Q.31 – Q.85 : Carry TWO marks each.

31. The rate of exchange of cyanide ligands in the complexes (i) $\left[Ni\left(CN\right)_4\right]^{2-}$, (ii) $\left[Mn\left(CN\right)_6\right]^{3-}$ and (iii) $\left[Cr\left(CN\right)_6\right]^{3-}$ by ^{14}CN follow the order.
(a) ii > i > iii (b) iii > i > ii (c) i > iii > ii (d) i > ii > iii

32. Ligand field stabilization energies are smaller for lanthanides compared to transition metals in the same oxidation state because
(a) size of lanthanide ions are larger (b) f orbitals interact less effectively with ligands
(c) size of lanthanide ions are smaller (d) lanthanides favour oxygen donor ligands

33. For the metal-olefin complexes (i) $[PtCl_3(C_2H_4)]^-$ and (ii) $[PtCl_3(C_2F_4)]^-$, the correct statement is that
(a) carbon-carbon bond length is same both in (i) and (ii)
(b) carbon-carbon bond length in (i) is smaller compared to that of (ii)
(c) carbon-carbon bond length in (i) is larger compared to that of (ii0
(d) a metallacycle is formed in each complex

34. A solution containing 47 ppm of a compound X (FW 225) has a transmittance of 29.7% in a 1.5 cm cell at 400 nm. The molar absorptivity in L mol^{-1} cm^{-1} is
(a) 1.89×10^3 (b) 1.42×10^3 (c) 1.68×10^3 (d) 1.79×10^3

35. The values of M–C stretching frequencies of (i) $\left[V\left(CO\right)_6\right]^-$, (ii) $\left[Cr\left(CO\right)_6\right]$ and (iii) $\left[Mn\left(CO\right)_6\right]^+$ follow the trend
(a) (ii) > (i) > (iii) (b) (ii) > (iii) > (i) (c) (i) > (ii) > (iii) (d) (iii) > (ii) > (i)

36. A substance undergoes a two electron reversible reduction at dropping mercury electrode, and gives a diffusion current of $7.5\mu A$. When the potential at the dropping mecury electrode is –0.615 V, the current is $1.5\ \mu A$. The $E_{1/2}$ (in volt) will be
(a) –0.683 (b) –0.674 (c) –0.652 (d) –0.633

37. The lanthanide complex (acac = acetylacetonate; phen = 1, 10-phennathroline) that do not have square antiprismatic structure is

(a) $\left[Ce(NO_3)_6\right]^{2-}$ (b) $\left[La(acac)_3(H_2O)_2\right]$

(c) $\left[Ce(acac)_4\right]$ (d) $\left[Eu(acac)_3(Phen)\right]$

38. Among the following, the incorrect statement about SiC is that
(a) it is known as corundum
(b) it is prepared by reducing quartz with a slight excess of coke in an electric furnace at 2000–2500°C
(c) pure SiC is almost colourless or pale yellow
(d) its hardness is slightly less than diamond.

39. The incorrect statement regarding carboranes is that
(a) carbon tends to adopt the position of the lowest coordination number on the polyhedron
(b) CH groups tend to be more positive than BH groups with the same coordination number
(c) carbon tends to keep as close as possible to other carbon atoms
(d) generally, arachno-carboranes are less stable thermally than the corresponding closo-carboranes

40. The incorrect statement for solid sodium chloride is that

(a) both sodium and chloride ions adopt inert gas configuration
(b) the conduction band is full
(c) the condduction band is empty
(d) the valence band is full

Q.41 – Q.48 required matching of items of ***Column-I*** with the appropriate items in ***Column-II***. Choose the correct one from the alternatives (a), (b), (c) and (d)

41.

Column-I	**Column-II**
(P) Cytochromec	(I) Molybdenum
(Q) Calmodulin	(II) Potassium
(R) Chlorophyll	(III) Magnesium
(Q) Alcohol dehydrogenase	(IV) Zinc
	(V) Iron
	(VI) Calcium

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

42.

Column-1	**Column-2**
P. Atomic absorption	I. Transition time
Q. Chronopotentiometry	II. Cell constant
R. Spectrophotometry	III. Coulomb
S. Conductometry	IV. Molar absorptivity
	V. Limiting current
	VI. Hollow cathode lamp

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

43. Require matching of items of **Column I** with the appropriate items in **Column - II.** Choose the correct one from the alternatives (a), (b), (c) and (d).

Column - I	**Column - II**
P: Wilkinson's catalyst	I. trans $-\mathrm{IrCl(CO)(PPh_3)_2}$
Q: Speiers's catalyst	II. Hydrosilylation
R: Water gas shift catalyst	III. $\mathrm{RhCl(PPh_3)_3}$
S: Zeolite ZSM-5 catalyst	IV. Synthetic gasoline
	V. hydroformlylation
	VI. Zinc-copper oxide.

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

44.

Column-1	**Column-2**
P. Ostwald process	I. Manufacture of nickel
Q. Solvay process	II. Manufacture of nitric acid
R. Mond process	III. Manufacture of $\mathrm{Na_2CO_3}$
S. Frasch process	IV. Manufacture of silicones
	V. Manufacture of caustic soda
	VI. Mining of elemental sulfur

Codes:

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

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

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

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

45.

Column-I (Compounds)	**Column-2 (Carbonyl stretching frequency ($\mathrm{cm^{-1}}$))**
P. cyclohexanone	I. 1910
Q. cyclopentanone	II. 1715
R. cyclobutanone	III. 1813
S. cyclopropanone	IV. 1650
	V. 1780
	VI. 1745

Codes:

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

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

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

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

46.

Column-I	**Column-2**
P. Many electron wave function	I. Adiabatic demagnetization
Q. Low temperature	II. Slater determinant
R. Mean speed	III. Partition function
S. Molecular ensemble	IV. maxwellian distribution
	V. LCAO-MO
	VI. Photoejection

Codes:

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

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

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

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

47. Require matching of items of **column - I** with the approriate items in **column - II.** Choose the correct one from the alternative (a), (b), (c) and (d).

Column - I **Spectral Technique**	**Column - II** **Selection Rule**
P. Rotational transition	**I.** $\Delta v = \pm 1$
Q. Vibrational transition	**II.** $\Delta J = 0$
R. Electronic transition in atoms	**III.** $\Delta J = \pm 1$
S. Molecular ensemble	**IV.** $\Delta l = \pm 1$
	V. $\Delta m_1 = \pm 1$
	VI. $\Delta v = 0$
	VII. $\Delta l = 0$

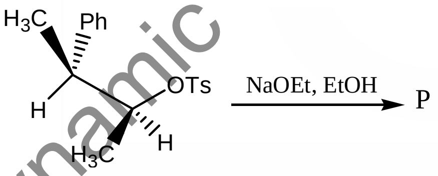
(a) P-I, Q-VI, R-VII, S-V
(b) P-II, Q-I, R-IV, S-V
(c) P-III, Q-I, R-IV, S-V
(d) P-I, Q-VI, R-VII, S-V

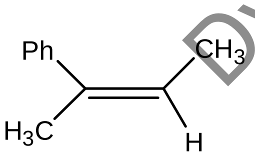
48.

Column-1 (Molecular species)	**Column-2 (Bond order and magnetic property)**
P. O_2^-	I. 2.5, paramagnetic
Q. O_2	II. 2.0, diamagnetic
R. O_2^+	III. 1.5, diamagnetic
S. O_2^{2-}	IV. 1.0, diamagnetic
	V. 2.0, paramagnetic
	VI. 1.5, paramagnetic

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

49. The major product P formed in the given



(a)


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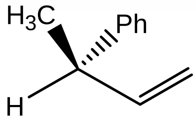
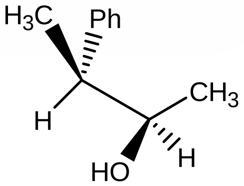
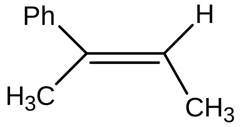
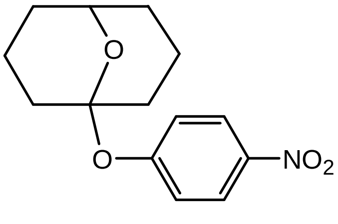


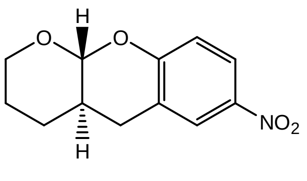
(c)


(d)


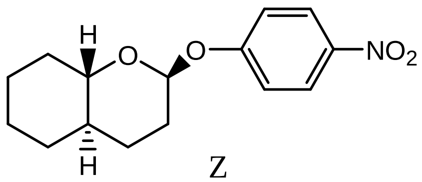
50. The order of reactivity towards acid catalyzed hydrolysis of the following cyclic acetals is:



X



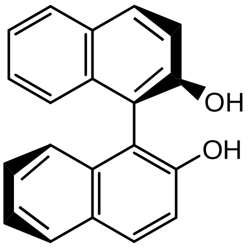
Y



Z

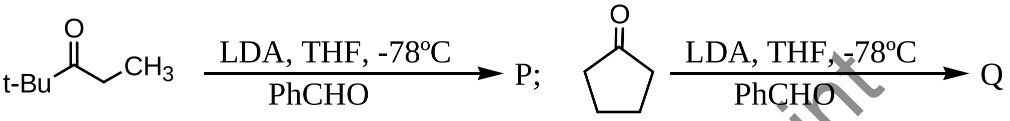
(a) Z > Y > X
(b) X > Y > Z
(c) X > Z > Y
(d) Z > X > Y

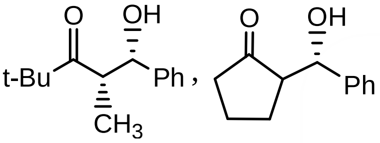
51. The binaphthol (Bnp) is:

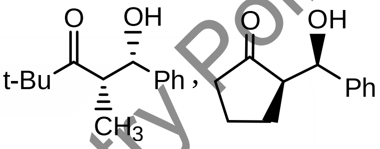


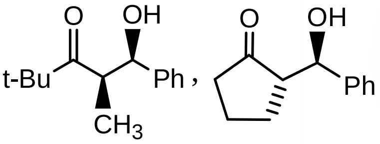
(a) An optically active compound with (R)-configuration.
(b) An optically inactive compound.
(c) A meso compound
(d) An optically active compound with (S)-configuration.

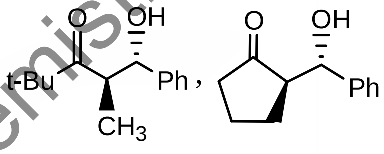
52. In the given reactions, identify the correct combination of their major products P and Q $\left[\text{LDA} = \text{LiN(i-Pr)}_2\right]$



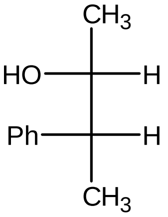
(a)


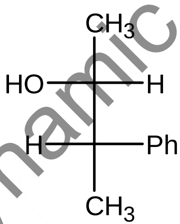
(b)


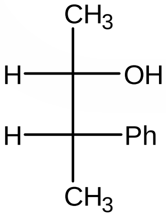
(c)


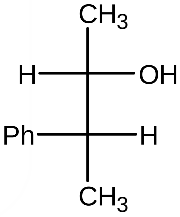
(d)


53. The major stereoisomer obtained in the reaction of (S)-2-phenylpropanal with MeMgBr is:

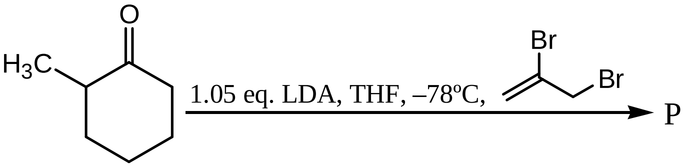
(a)


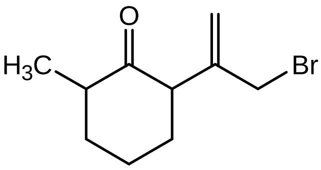
(b)


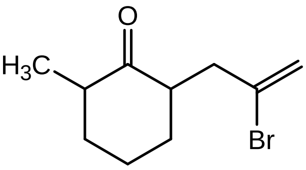
(c)


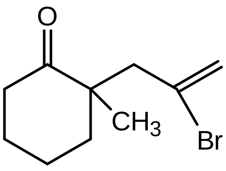
(d)


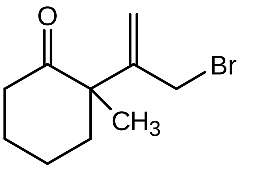
54. The major product P formed in the following reaction is



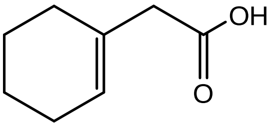
(a)


(b)


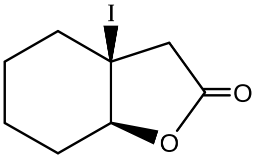
(c)


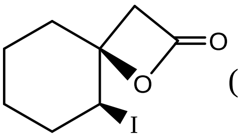
(d)


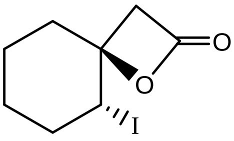
55. Iodo-lactonization of β, γ – unsaturated carboxylic acid X with I_2 and $NaHCO_3$ gives.

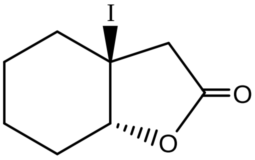


X

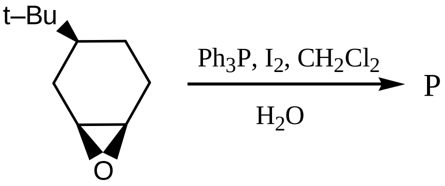
(a)


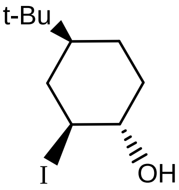
(b)


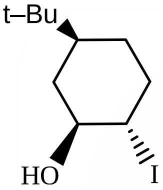
(c)


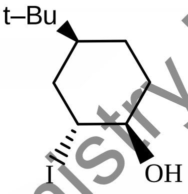
(d)


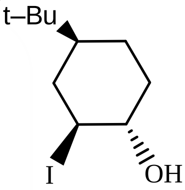
56. The major stereoisomer P obtained in the following reaction is:



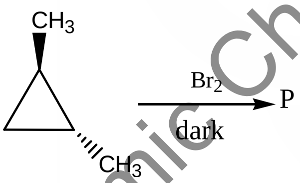
(a)


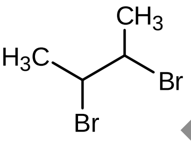
(b)


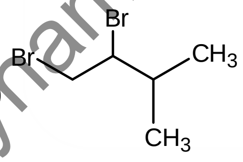
(c)


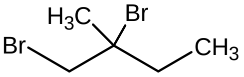
(d)


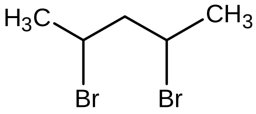
57. The major product P of the following reaction is:



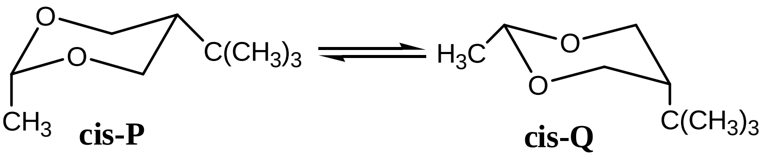
(a)


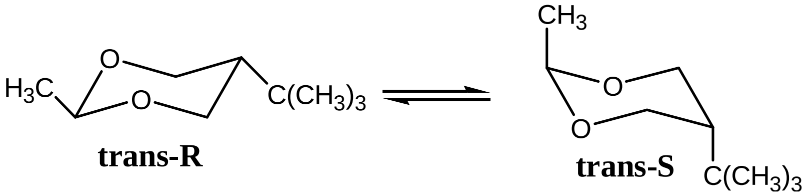
(b)


(c)


(d)


58. Cis-and trans-2-methyl-5-t-butyl-1, 3-dioxane each can exist as two conformers as shown below

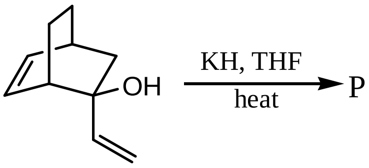


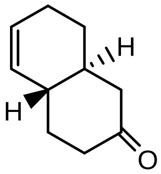


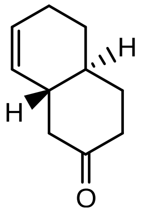
The preferred conformations for the cis- and trans-compounds will be

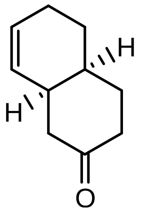
(a) P, R (b) Q, S (c) P, S (d) Q, R

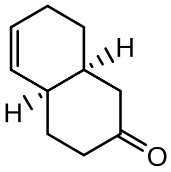
59. The major product P of the given reaction is



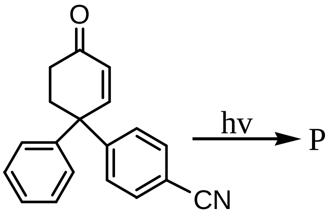
(a) 

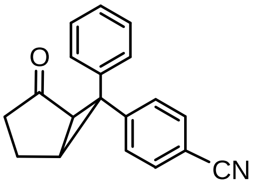
(b) 

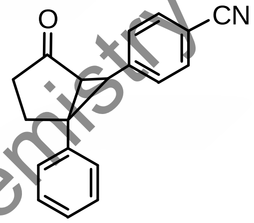
(c) 

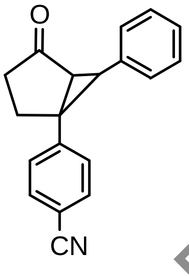
(d) 

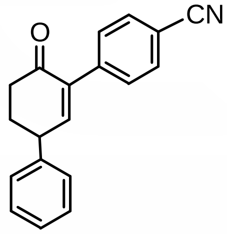
60. The major product P formed in the following photochemical reaction is



(a) 

(b) 

(c) 

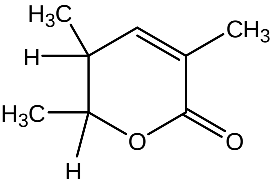
(d) 

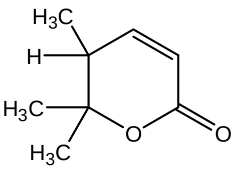
61. An organic compound having molecular formula $C_8H_{12}O_2$ exhibits the following peaks in IR and ^{1}H NMR spectra.

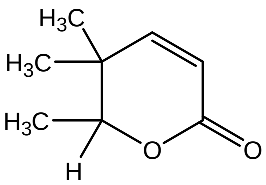
$\text{IR}: 1720\ (\text{cm}^{-1})$

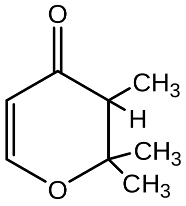
$^1\text{H NMR}: 6.95\ (1\text{H, d, J} = 8.5\text{ Hz})\ 5.90\ (1\text{H, d, J} = 8.5\text{ Hz}),\ 4.53\ (1\text{H, q, J} = 6\text{ Hz}),$

$1.41\ (3\text{H, d, J} = 6\text{ Hz}),\ 1.20\ (3\text{H, s}),\ 1.15\ (3\text{H, s})$

(a) 

(b) 

(c) 

(d) 

62. The phase diagram of $NaCl-H_2O$ is of simple eutectic type. The utectic composition is 23.3 weight% NaCl and it freezes at –21.1ºC. The phases present in a solution containing 10 weight% NaCl at –20ºC are
(a) ice + NaCl solution (b) ice + solid NaCl
(c) NaCl + pure water (d) NaCl + saturated NaCl solution

63. Hydrogen adsorption on a platinum surface is
(a) Endothermic with positive ΔS and positive ΔG
(b) Endothermic with positive ΔS and negative ΔG
(c) Exothermic with negative ΔS and negative ΔG
(d) Exothermic with positive ΔS and negative ΔG

64. In the reversible chemical reaction taking place under standard condition at 298 K and 1 atm in a Daniel cell,

$$Zn\left|Zn^{2+}(aq)\right|\left|Cu^{2+}(aq)\right|Cu$$

the heat change is:

(a) equal to ΔH^0 (b) equal to $T\Delta S^0$ (c) equal to zero (d) equal to ΔU^0

65. The orbital $\psi = 1s_{H_A} - 1s_{H_B}$ of water belongs to the irreducible representation
(a) A_1 (b) B_1 (c) A_2 (d) B_2

66. The vibrational partition function for a molecule with fundamental frequency *v* is given by

(a) $\exp\left(-\frac{\hbar\upsilon}{k_BT}\right)$ (b) $\left[1-\exp\left(-\frac{\hbar\upsilon}{k_BT}\right)\right]^{-1}$

(c) $\exp\left(-\frac{\hbar\upsilon}{k_BT}\right)\left[1-\exp-\left(\frac{\hbar\upsilon}{k_BT}\right)\right]^{-1}$ (d) $\exp\left(-\frac{\hbar\upsilon}{2k_BT}\right)\left[1-\exp-\left(\frac{\hbar\upsilon}{k_BT}\right)\right]^{-1}$

67. The internal pressure, $\pi_T = T\left(\frac{\partial P}{\partial T}\right)_V - P$ for one mole a Vander waals gas is

(a) $\frac{a}{V^2}$ (b) $\frac{a}{V^2}\left(\frac{RT}{V-b}\right)$ (c) Zero (d) $\frac{RT}{V-b}$

of 10^{-3} mol of this sample. Assuming the sample absorbs all the light, the quantum yield for this photochemical reaction is:

(a) 6.023 (b) 0.602 (c) 60.230 (d) 0.060

69. If standard emf of the cell,

$$Cu\,|\,Cu^{2+}(aq)\,||\,[Cu(NH_3)_4]^{2+},\ aq.\ NH_3\,|\,Cu$$

is 0.35, then stability constant of the formation cupric amine complex is

(a) 1.0×10^{27} (b) 8.4×10^{5} (c) 7.0×10^{11} (d) 4.3×10^{13}

70. Standard entropy of crystalline carbon monoxide (in J/mol) at 0 K is around
(a) 0.03 (b) 2.50 (c) Zero (d) 5.76

71. Matals used in automobile catalytic converters are:
(a) Pt and Pd (b) Pt and Rh (c) Pd and Rh (d) Rh and Ni

Q. 72 to Q. 77 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 but Assertion is wrong
(d) Reason is wrong but Assertion is correct

72. Statement: The characteristic spectroscopic feature of the quadruply bonded $\left[Re_2\,Cl_8\right]^{2-}$ is a strong royal blue colur
Reason: This is due to an absorption band in the visible region due to excitation of an electron from $\sigma^2\pi^4\delta^2$ ground state to $\sigma^2\pi^4\delta^1\delta^{*1}$ excited state
Assertion: This transition is quantum mechanically allowed

73. Statement: For the reaction $L_nMH \rightarrow L_nM^- + H^+$, the important factors are the strength of the M–H bond and the nature of the ligand, L
Reason: The key here is the stability of the complex ion, L_nM^-
Assertion: Weak π-bonding ligands will stabilize L_nM^- and so will disfavour the forward reaction.

74. **Statement:** D-Glucose and D-mannose give the same phenylosazone. **[GATE 2005]**
Reason: Osazone formation results in a loss of the stereocentre at C_2 but does not affect other stereocenters.
Assertion: D-Glucose and D-mannose are enantiomers.
(a) Both **Reason** and **Assertion** are correct
(b) Both **Reason** and **Assertion** are wrong.
(c) **Reason** is correct but **Assertion** is wrong.
(d) **Reason** is wrong but **Assertion** is correct.

75. **Statement:** Nucleosides are stable in dilute base but undergo hydrolysis in dilute acid. **[GATE 2005]**
Reason: Nucleosides have an N-glycosidic linkage.
Assertion: N-Glycosidic linkage behaves like an O-glycosidic linkage which is rapidly hydrolyzed by aqueous acid but stable in aqueous base.
(a) Both **Reason** and **Assertion** are correct
(b) Both **Reason** and **Assertion** are wrong.
(c) **Reason** is correct but **Assertion** is wrong.
(d) **Reason** is wrong but **Assertion** is correct.

76. **Statement :** For the reaction of $NO + O_2 \rightarrow 2NO_2$ the rate constant is observed to decrease with temperature.
Reason : As per the proposed mechanism, the first step is the dimerization of nitric oxide which is exothermic.
Assertion : Rate law = $k_2K.[NO]_2[O_2]$
(a) Both Reason and Assertion are correct
(b) Both Reason and Assertion are wrong
(c) Reason is correct but Assertion is wrong
(d) Reason is wrong but Assertion is correct.

77. Statement: Hydrogen gas gets warmer on expanding under isenthalpic condition
Reason: Joule Thomson coefficient for hydrogen is –0.03 K/atm
Assertion: Attractive forces are the dominant intermolecular interactions in hydrogen gas at 273 K.

Common Data for Q. 78, Q.79 and Q.80:

Vapour pressures of water above pure liquid water 24, 529 and 760 torr respectively at 298, 363 and 373 K. Use these data to answer the questions 78, 79 and 80.

78. Change in chemical potential (in kJ/mol) for the equilibrium H_2O (liquid) = H_2O (gas) at 298K is
(a) 8.6 (b) –3.8 (c) 7.87 (d) 3.72

79. Aqueous solution of sodium chloride $(\chi_{\text{NaCl}} = 0.015)$ at 298 K is in equilibrium with a water vapour pressure (in torr) of

(a) 23.64 (b) 748.60 (c) 24.36 (d) negligible

80. Average value of enthalpy of vaporisation (in kJ/mol) of water between 363 and 373 K is

(a) 42.50 (b) 40.80 (c) –40.65 (d) –40.80

Linked Answer Q.81(a) and Q.81(b):

81.(a) As per Huckel theory, π-electron energy levels of cyclobutadiene are

(a) $\alpha+2\beta, \alpha+\beta, \alpha-\beta, \alpha-2\beta$ (b) $\alpha+2\beta, \alpha-\beta, \alpha-\beta, \alpha-2\beta$

(c) $\alpha+2\beta, \alpha, \alpha, \alpha-2\beta$ (d) $\alpha+\beta, \alpha-\beta, \alpha-\beta, \alpha-2\beta$

81.(b) Given that $\beta = -75\ kJ/mol$, cyclobutadiene is

(a) paramagnetic and its lowest absorption energy is 150 kJ

(b) paramagnetic and its lowest absorption energy is 75 kJ

(c) diamagnetic and its lowest absorption energy is 75 kJ

(d) diamagnetic and its lowest absorption energy is 150 kJ.

Linked Answer Q.82(a) and Q.82(b):

82.(a) For the complex ion $\left[\text{Cu}\left(\text{NH}_3\right)_6\right]^{2+}$, the coordination geometric will be

(a) octahedral (b) tetragonally distorted octahedral

(c) trigonal prismatic (d) trigonal antiprismatic

82.(b) The number of possible d-d transitions will be

(a) one (b) two (c) three (d) four

Linked Answer Q.83(a) and Q.83(b):

83.(a). The following data was obtained with the GLC. Column temperature, 60ºC, inlet pressure, 1270 torr, outlet pressure, 770 torr, flow rate of carrier gas at 25ºC, 18 mL/min and retention time for air, 0.30 min, the pressure drop correction factor will be

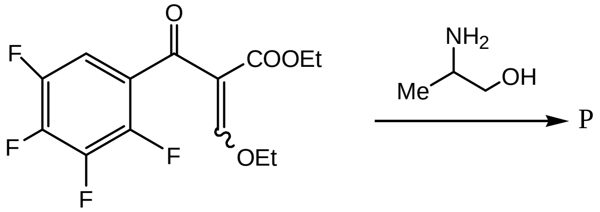
(a) 0.648 (b) 0.740 (c) 0.770 (d) 0.715

83.(b). Corrected retention volume for air (mL) will be

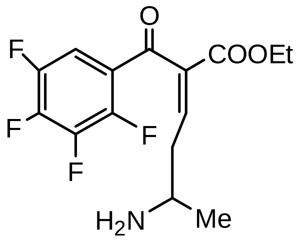
(a) 4.02 (b) 4.72 (c) 4.46 (d) 4.25

Linked Answer Q.84(a) and Q.84(b):

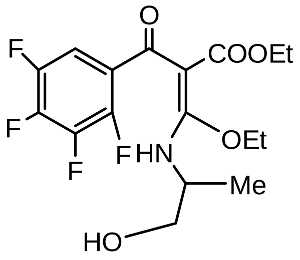
84.(a). The major product P of the following reaction is:

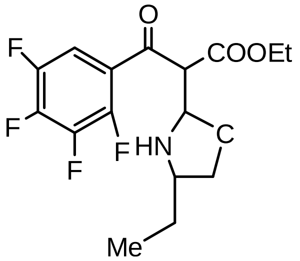


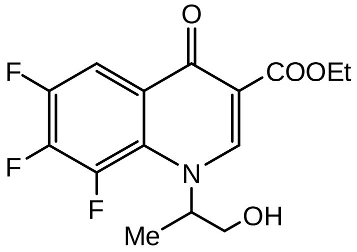
(a)



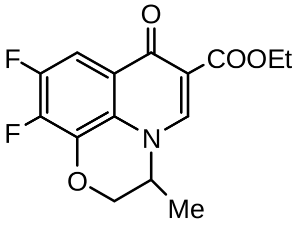
(b)

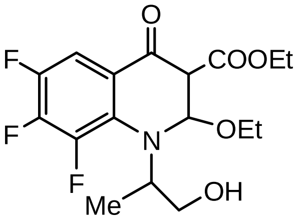


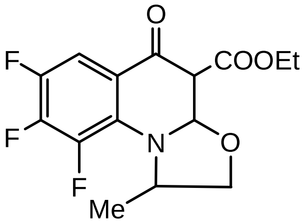
(c) 

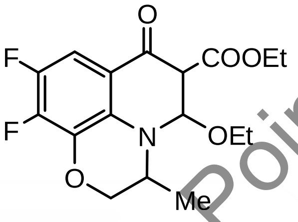
(d) 

84.(b). Major compound Q obtained on reaction of P with NaH in DMF is:

(a) 

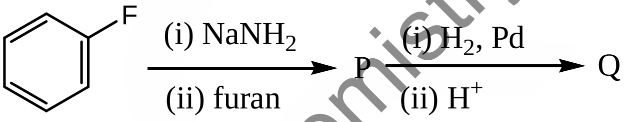
(b) 

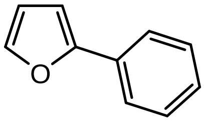
(c) 

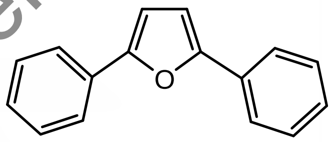
(d) 

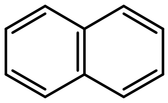
Linked Answer Q.85(a) and Q.85(b):

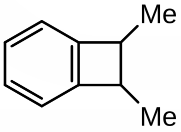
85. (a) In the follwoing sequence of reactions, the major product Q is:



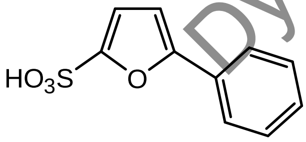
(a) 

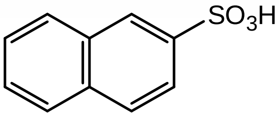
(b) 

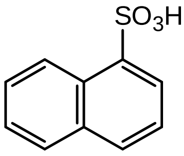
(c) 

(d) 

85.(b) The major product on sulphonation of Q with H_2SO_4 at 160ºC is:

(a) 

(b) 

(c) 

(d)