Test Paper : **III**

Test Subject : **CHEMICAL SCIENCES**

Test Subject Code : **A-02-03**

Test Booklet Serial No. : _____

OMR Sheet No. : _____

Hall Ticket No. | | | | | | | | | |

(Figures as per admission card)

Name & Signature of Invigilator

Name : _____ Signature : _____

Paper : III

Subject : CHEMICAL SCIENCES

Time : 2 Hours 30 Minutes Maximum Marks : 150

Number of Pages in this Booklet : **16** Number of Questions in this Booklet : **75**

Instructions for the Candidates

1. Write your Hall Ticket Number in the space provided on the top of this page.
2. This paper consists of seventy five multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal on the edge of this cover page. Do not accept a booklet without sticker-seal and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the Test Booklet Number should be entered in the OMR Sheet and the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example: (A) (B) ● (D)
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet given to you**. If you mark at any place other than in the circle in the Answer Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your name or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. You have to return the test question booklet and OMR Answer Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

అభ్యర్థులకు సూచనలు

1. ఈ పుట పై భాగంలో ఇవ్వబడిన స్థలంలో మీ హాల్ టికెట్ నంబరు రాయండి.
2. ఈ ప్రశ్న పత్రము డెబ్భైఐదు బహుళైచ్ఛిక ప్రశ్నలను కలిగి ఉంది.
3. పరీక్ష ప్రారంభమున ఈ ప్రశ్నాపత్రము మీకు ఇవ్వబడుతుంది. మొదటి ఐదు నిమిషములలో **ఈ ప్రశ్నాపత్రమును తెరిచి కింద తెలిపిన అంశాలను తప్పనిసరిగా పరిచూసుకోండి.**
   (i) ఈ ప్రశ్న పత్రమును చూడడానికి కవర్‌పేజి అంచున ఉన్న కాగితపు సీలును చించండి. స్టిక్కర్ సీలులేని మరియు ఇదివరకే తెరిచి ఉన్న ప్రశ్నాపత్రమును మీరు అంగీకరించవద్దు.
   (ii) **కవరు పేజి పై ముద్రించిన సమాచారం ప్రకారం ఈ ప్రశ్నపత్రములోని పేజీల సంఖ్యను మరియు ప్రశ్నల సంఖ్యను పరిచూసుకోండి. పేజీల సంఖ్యకు సంబంధించి గానీ లేదా సూచించిన సంఖ్యలో ప్రశ్నలు లేకపోవుట లేదా నిజప్రతి కాకపోవుట లేదా ప్రశ్నలు క్రమపద్ధతిలో లేకపోవుట లేదా ఏవైనా తేడాలుండుట వంటి దోషపూరితమైన ప్రశ్న పత్రాన్ని పెంటనే మొదటి ఐదు నిమిషాల్లో పరీక్షా పర్యవేక్షకునికి తిరిగి ఇచ్చివేసి దానికి బదులుగా సరిగ్గా ఉన్న ప్రశ్నపత్రాన్ని తీసుకోండి. తదనంతరం ప్రశ్నపత్రము మార్చబడదు అదనపు సమయం ఇవ్వబడదు.**
   (iii) పై విధంగా పరిచూసుకొన్న తర్వాత ప్రశ్నాపత్రం సంఖ్యను OMR పత్రము పై అదేవిధంగా OMR పత్రము సంఖ్యను ఈ ప్రశ్నాపత్రము పై నిర్దిష్టస్థలంలో రాయవలెను.
4. ప్రతి ప్రశ్నకు నాలుగు ప్రత్యామ్నాయ ప్రతిస్పందనలు (A), (B), (C) మరియు (D) లుగా ఇవ్వబడ్డాయి. ప్రతిప్రశ్నకు సరైన ప్రతిస్పందనను ఎన్నుకొని కింద తెలిపిన విధంగా OMR పత్రములో ప్రతి ప్రశ్నా సంఖ్యకు ఇవ్వబడిన నాలుగు వృత్తాల్లో సరైన ప్రతిస్పందనను సూచించే వృత్తాన్ని బాల్ పాయింట్ పెన్‌తో కింద తెలిపిన విధంగా పూరించాలి.
   ఉదాహరణ : (A) (B) ● (D)
   (C) సరైన ప్రతిస్పందన అయితే
5. ప్రశ్నలకు ప్రతిస్పందనలను ఈ ప్రశ్నపత్రముతో ఇవ్వబడిన OMR పత్రము పైన ఇవ్వబడిన వృత్తాల్లోనే పూరించి గుర్తించాలి. అలాకాక సమాధాన పత్రంపై వేరొక చోట గుర్తిస్తే మీ ప్రతిస్పందన మూల్యాంకనం చేయబడదు.
6. ప్రశ్న పత్రము లోపల ఇచ్చిన సూచనలను జాగ్రత్తగా చదవండి.
7. చిత్తుపనిని ప్రశ్నపత్రము చివర ఇచ్చిన ఖాళీస్థలములో చేయాలి.
8. OMR పత్రము పై నిర్ణీత స్థలంలో సూచించవలసిన వివరాలు తప్పించి ఇతర స్థలంలో మీ గుర్తింపును తెలిపే విధంగా మీ పేరు రాయడం గానీ లేదా ఇతర చిహ్నాలను పెట్టడం గానీ చేసినట్లయితే మీ అనర్హతకు మీరే బాధ్యులవుతారు.
9. పరీక్ష పూర్తయిన తర్వాత మీ ప్రశ్నపత్రాన్ని మరియు OMR పత్రాన్ని తప్పనిసరిగా పరీక్షపర్యవేక్షకుడికి ఇవ్వాలి. వాటిని పరీక్ష గది బయటకు తీసుకువెళ్లకూడదు.
10. **నీలి/నల్ల రంగు బాల్ పాయింట్ పెన్ మాత్రమే ఉపయోగించాలి.**
11. **లాగరిథమ్ టేబుల్స్, క్యాలిక్యులేటర్‌లు, ఎలక్ట్రానిక్ పరికరాలు మొదలగునవి పరీక్షగదిలో ఉపయోగించడం నిషేధం.**
12. **తప్పు సమాధానాలకు మార్కుల తగ్గింపు లేదు.**

CHEMICAL SCIENCES
Paper – III

1. The bond order and the number of unpaired electrons in O_2^- are respectively

I. 1.0

II. 1.5

III. 0

IV. 1

(A) I, III

(B) I, IV

(C) II, III

(D) II, IV

2. Among the following, the species which contains a multiple metal-metal bond is

(A) $Fe_3(CO)_{12}$

(B) Fe_3O_4

(C) $Cr_2(CH_3COO)_4$

(D) $Mn_2(CO)_{10}$

3. Paraldehyde is formed from

(A) Methanol

(B) Propanol

(C) Benzaldehyde

(D) Ethanal

4. Periodate oxidation of sucrose gives

(A) One mole of HCO_2H

(B) One mole of HCHO

(C) Two moles of HCO_2H

(D) Two moles of HCHO

5. The high resolution ^1H NMR spectrum of $CHCl_2 - CH_2Br$ exhibits

(A) Two doublets

(B) Two triplets

(C) One triplet and one doublet

(D) One singlet and one doublet

6. **Assertion (A)** : The chemical potential of i^{th} component in a mixture depends on the composition of the mixture.

Reason (R) : The molecular forces depend on the molecular environment.

(A) A is false, R is true

(B) A is true, R is false

(C) A and R are true but R is not the correct explanation of A

(D) A and R are true, and R is the correct explanation of A

7. Which of the following represents correct order of ligands in terms of their strength ?

(A) $CO > en > Cl^- > H_2O$

(B) $CO > Cl^- > en > H_2O$

(C) $CO > en > H_2O > Cl^-$

(D) $CO > H_2O > en > Cl^-$

8. The success of flame emission spectroscopy as an analytical technique depends on

(A) Ionization of sample

(B) Polymerization of sample

(C) Solvation of sample

(D) Atomization of sample

9. The reaction of 2-chloropyridine with sodium ethoxide is

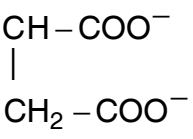
(A) Elimination followed by addition

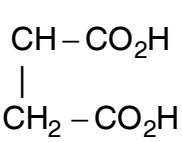
(B) Electrophilic aromatic substitution

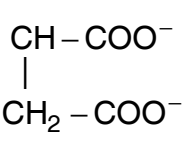
(C) Addition followed by substitution

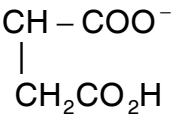
(D) Nucleophilic aromatic substitution

10. Aspartic acid at pH 10 exists as

(A) 

(B) 

(C) 

(D) 

11. Match the following

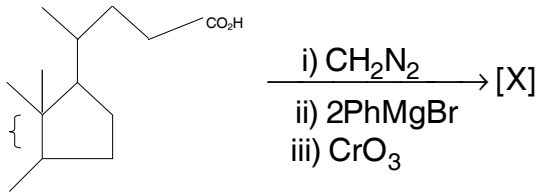
List – I	List – II
I. Phosphorescence	1. a schematic diagram of the various type of non-radiative and radiative transitions that can occur in molecules
II. Intersystem crossing	2. Spontaneous emission of radiation arising from a transition between states of different multiplicities
III. Fluorescence	3. Spontaneous emission of radiation arising from transition between states of the same multiplicity
IV. Jablonski diagram	4. Non-radiative transition between states of different multiplicity
	5. Non radiative transition between states of the same multiplicity

	I	II	III	IV
(A)	1	2	3	5
(B)	3	1	2	5
(C)	2	4	3	1
(D)	2	5	3	1

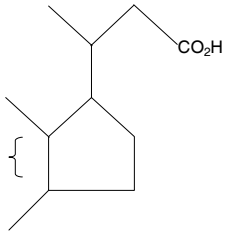
12. An ESR spectrum of hydrogen atom shows two lines. This is due to

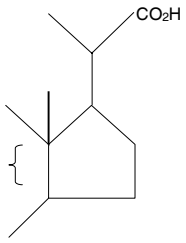
(A) Spin-spin coupling
(B) Quadrupole coupling
(C) Hyperfine coupling
(D) Antiferromagnetic coupling

13. In the following sequence of reactions



the major product [X] is

(A)


(B)


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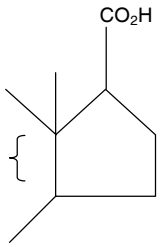
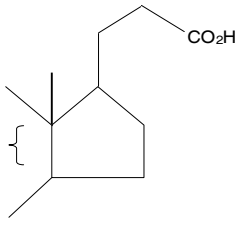


(D)


14. Mention the principle involved in LED-television

(A) Luminescence
(B) Phosphorescence
(C) Electroluminescence
(D) Fluorescence

15. In the transformation of oxyhemoglobin to deoxyhemoglobin

(A) Low spin Fe^{2+} changes to high spin Fe^{2+}
(B) Low spin Fe^{2+} changes to low spin Fe^{3+}
(C) High spin Fe^{2+} changes to low spin Fe^{2+}
(D) High spin Fe^{2+} changes to high spin Fe^{3+}

16. The correct statements among the following :

1. The canonical ensemble is an imaginary collection of replications of the actual system with a common temperature.
2. The Boltzmann distribution gives the number of the molecules in each state of a system at any temperature.
3. The partition function is an indication of the number of thermally accessible states at the temperature of interest.
4. The molecular partition function can be written as $q = q^T q^R q^V q^E$.

(A) 1 and 2 (B) 2, 3 and 4
(C) 1, 3 and 4 (D) All are correct

17. During expansion of an ideal gas for a given volume change, the change in pressure in adiabatic process (ΔP_{ad}) is _____ that of isothermal process (ΔP_{is}).

(A) Equal to (B) Exactly half
(C) Smaller than (D) Larger than

18. Huckel MO energy levels of ethylene are

(A) $\alpha + 2\beta; \alpha - 2\beta$

(B) $\alpha + \beta; \alpha - \beta$

(C) $\alpha + \frac{1}{2}\beta; \alpha - \frac{1}{2}\beta$

(D) $\alpha + 3\beta; \alpha - 3\beta$

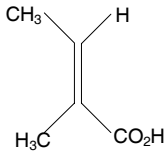
19. Match the following :

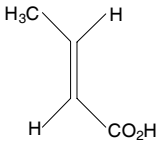
I. Maleic acid

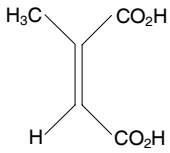
II. Citraconic acid

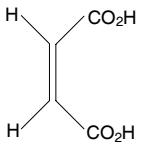
III. Crotonic acid

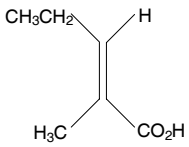
IV. Tiglic acid

1. 

2. 

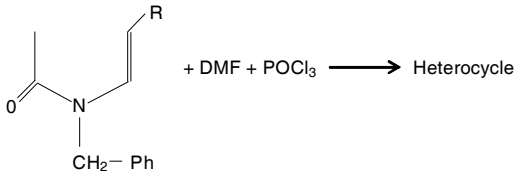
3. 

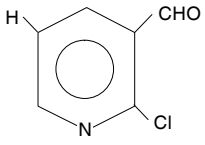
4. 

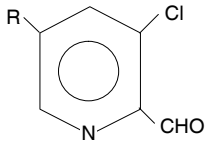
5. 

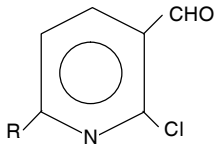
	I	II	III	IV
(A)	1	4	2	3
(B)	4	3	2	1
(C)	3	1	5	2
(D)	2	3	1	5

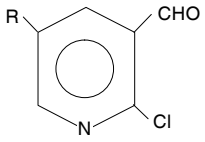
20. Identify the heterocycle formed



(A) 

(B) 

(C) 

(D) 

21. The dark purple colour of KM_nO_4 is due to

(A) d-d transition

(B) Absorption edge transition

(C) Charge transfer process

(D) $\sigma \rightarrow \pi^*$ transition

22. ^{19}F NHR spectrum of PCl_2F_3 shows

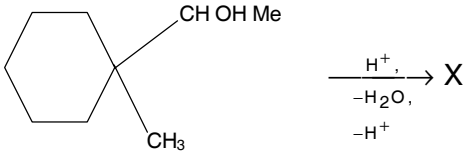
(A) Two triplets and two doublets

(B) Two triplets and one doublet

(C) Two doublets and two triplets

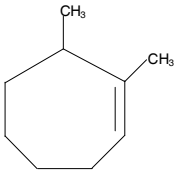
(D) One singlet and two triplets

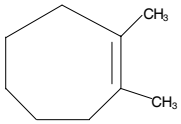
23. The product formed in the following reaction is

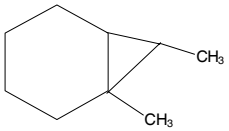


X is

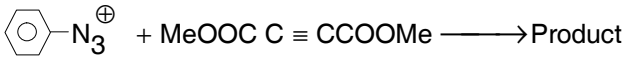
(A) 

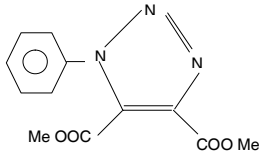
(B) 

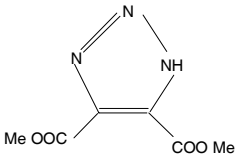
(C) 

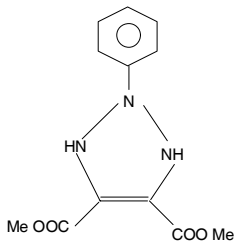
(D) 

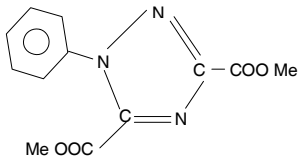
24. Predict the product of dipolar addition



(A) 

(B) 

(C) 

(D) 

25. Match the following :

List I	List II
I. $H\psi = E\psi$	1. Planck
II. $E = h\nu$	2. Born
III. $\lvert \psi \rvert^2$	3. Dirac
IV. $\lambda = h/mV$	4. De Broglie
	5. Schrodinger

	I	II	III	IV
(A)	5	1	2	4
(B)	1	2	3	4
(C)	4	5	2	1
(D)	3	2	4	1

26. Identify from the following systems in which orbital contribution to magnetic moment is expected

I. $[Mn(H_2O)_6]^{2+}$

II. $[MnBr_4]^{2-}$

III. $[Fe(CN)_6]^{3-}$

IV. $[Co(H_2O)_6]^{2+}$

(A) I, II (B) II, III

(C) III, IV (D) I, IV

27. Mossbauer spectroscopy is concerned with

I. Doppler effect

II. Photoelectric effect

III. Recoil energy

IV. Cotton effect

(A) I, II (B) I, III

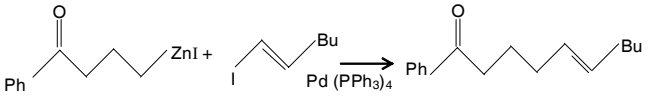
(C) II, III (D) II, IV

28. Match the following :

List – I (Compound)	List – II (Nature)
I. $K_2 Cr_2 O_7$	1. Anticancer agent
II. EDTA	2. Reductant
III. KI	3. Chelating agent
IV. Cis-Pt $(NH_3)_2 Cl_2$	4. Oxidant
	5. Desiccant

	I	II	III	IV
(A)	4	3	2	1
(B)	2	3	4	1
(C)	5	3	2	1
(D)	5	3	4	1

29. The reaction given below is an example of



(A) Nazarov reaction
(B) Nef reaction
(C) Negishi reaction
(D) Nicholas reaction

30. Select the correct statements from the following :

1. Coagulation of a colloid is the reversible aggregation of dispersed phase.
2. Flocculation of a colloid is the irreversible aggregation of the dispersed phase.
3. Colloids are purified by electrodialysis.
4. Hydrophobic colloids are flocculated most efficiently by the ions of opposite charge.

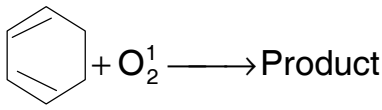
(A) 1, 3 and 4 (B) 2, 3 and 4
(C) 1, 2 and 3 (D) 3 and 4

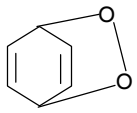
31. Assertion (A) : In a catalysed reaction a small amount of the catalyst brings a large change in the rate of the reaction.

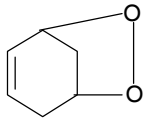
Reason (R) : A catalyst doesnot participate in the reaction.

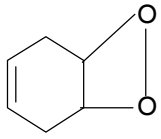
(A) Both A and R are true but R is not the correct explanation of A
(B) A is true R is false
(C) A is false R is true
(D) Both A and R are true and R is the correct explanation for A

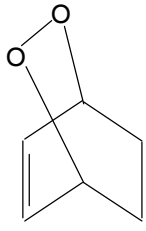
32. Identify the product resulting from singlet oxygen and cyclohexadiene



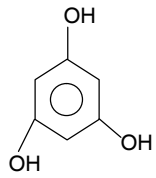
(A) 

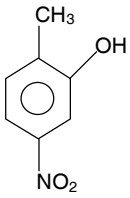
(B) 

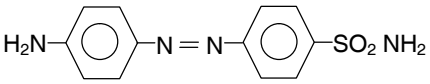
(C) 

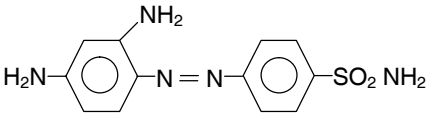
(D) 

33. Identify prontosil from the following

(A) 

(B) 

(C) 

(D) 

34. Match the following :

List – I (Complex)	**List – II (Hybridization of Central Atom)**
I. $[Pt\ Cl_4]^{2-}$	1. sp^3
II. $[Ni(CO)_4]$	2. dsp^2
III. $[Fe(CO)_5]$	3. dsp^3
IV. $[Cr(CO)_6]$	4. d^2sp^3
	5. d^3sp^3

	I	II	III	IV
(A)	1	2	5	4
(B)	2	1	3	4
(C)	3	1	4	2
(D)	2	1	5	4

35. The quadrupole nuclei among the following are

I. ^{12}C

II. ^{13}C

III. ^{14}N

IV. ^{35}Cl

(A) I, III (B) II, III

(C) II, IV (D) III, IV

36. In the extraction of metal ions from water into an organic solvent, some of the desirable characteristics of the organic solvent are

I. Low miscibility with water

II. Low toxicity

III. High miscibility with water

IV. High toxicity

(A) I, II (B) II, III

(C) III, IV (D) I, IV

37. Assertion (A) : The entropy of a gaseous mixture is greater than the sum of the entropies of the individual gases.

Reasoning (R) : All spontaneous processes are accompanied by an increase in entropy.

(A) A is true and R is false

(B) A is false and R is true

(C) A and R are true but R is not the correct explanation of A

(D) A and R are true and R is the correct explanation of A

38. The correct statements among the following are

1. A catalyst does not affect the equilibrium constant.
2. Le Chatelier's principle states that a system at equilibrium, when subjected to a disturbance responds in a way that minimizes the effect of the disturbance.
3. Increase in temperature favours the reactants in endothermic reactions and products in exothermic reactions.
4. Oxidation is the removal of electrons from a species and reduction is the addition of electrons to a species.

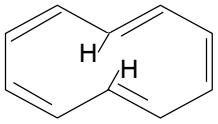
(A) 1, 2 and 3 (B) 1, 2 and 4
(C) 1, 3 and 4 (D) 2, 3 and 4

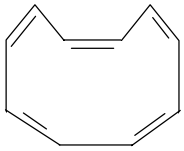
39. Match the following :

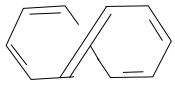
List – I (Species)	**List II (Nature)**
I. Chlorophyll	1. Contains Co (III) ion
II. Haemoglobin	2. Non-heme iron sulphur protein
III. Vitamin B_{12}	3. Contains Mg
IV. Rubredoxin	4. Anticancer drug
	5. Contains Fe (II)

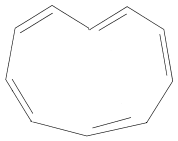
	I	II	III	IV
(A)	1	2	5	4
(B)	3	5	1	2
(C)	5	4	3	1
(D)	3	2	4	5

40. The Z, Z, Z, Z, Z – isomer of [10] annulene is

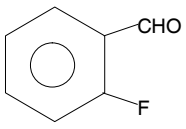
(A) 

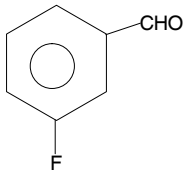
(B) 

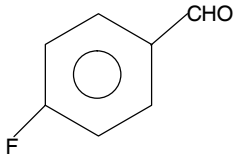
(C) 

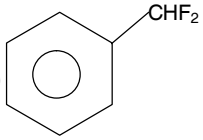
(D) 

41. When benzaldehyde is treated with SF_4, the product X is obtained. Identify 'X' among the following.

(A) 

(B) 

(C) 

(D) 

42. In quantum mechanical tunnelling the transmission coefficient

(A) Increases with the thickness of the barrier
(B) Decreases exponentially with the thickness of the barrier
(C) Decreases with the square of the thickness of the barrier
(D) Doesnot depend on the thickness of the barrier

43. Example of fermions are

(A) Electron and proton

(B) Photon and proton

(C) Electron and photon

(D) Photons

44. The molecule H_2O_2 belongs to _____ point group.

(A) C_2v (B) C_2h

(C) D_2h (D) C_2

45. Match the following

List – I	List – II
I. Joule-Thomson coefficient	1. PV = constant
II. Equation of state of a gas at its Boyle temperature	2. $\frac{q_{rev}}{T}$
III. Entropy change of a system during irreversible process	3. $\frac{q_{irrev}}{T}$
IV. Vant Haffs reaction isotherm	4. $\left(\frac{\delta T}{\delta P}\right)_H$
	5. $K_p \alpha e^{-\Delta G^\circ/RT}$
	6. $\left(\frac{\delta P}{\delta T}\right)_H$

	I	II	III	IV
(A)	3	2	1	4
(B)	4	1	2	5
(C)	6	1	2	5
(D)	4	3	6	2

46. Which of the following exhibit quadrupole splitting ?

I. $K_4[Fe(CN)_6]$ II. $K_3[Fe(CN)_6]$

III. $[Fe(H_2O)_6]Cl_3$ IV. $Fe(CO)_5$

(A) I, II (B) I, III

(C) II, III (D) II, IV

47. Assertion (A) : Zn^{2+} ion is zinc finger proteins is bound to S_2N_2 system.

Reason (R) : Zn^{2+} ion is borderline acid and is stable with borderline S_2N_2 system.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

48. Match the following :

List – I (Ion)	List – II (Electron Configuration)
I. Ce^{3+}	1. [Xe] $4f^4$
II. Pm^{3+}	2. [Xe] $4f^1$
III. Gd^{3+}	3. [Xe] $4f^5$
IV. Lu^{3+}	4. [Xe] $4f^7$
	5. [Xe] $4f^{14}$

	I	II	III	IV
(A)	2	4	1	3
(B)	1	2	5	4
(C)	2	1	4	5
(D)	1	3	4	5

49. A linear molecule having N atoms has _____ number of independent modes of vibration.

(A) 3N – 5 (B) 3N – 6

(C) 3N (D) 3N – 3

50. Lowest allowed energy is equal to zero for a

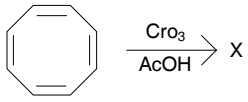
(A) Harmonic oscillator

(B) Particle in a two dimensional box

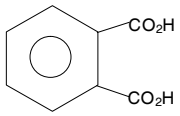
(C) A rigid rotator

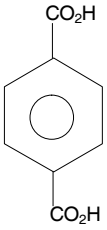
(D) Hydrogen atom

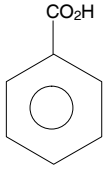
51. Identify the product in the following reaction

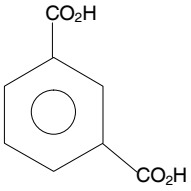


X is

(A) 

(B) 

(C) 

(D) 

52. Match the following

I. Aerosol	1. Cyclopropane
II. Insecticide	2. Iodoform
III. Anaesthetic	3. P-dichlorobenzene
IV. Antiseptic	4. Freon
	5. CCl_4

	I	II	III	IV
(A)	4	3	1	2
(B)	2	3	4	1
(C)	3	2	1	4
(D)	4	5	3	2

53. For a one component system the maximum number of phases that can coexist at equilibrium are

(A) 4 (B) 3

(C) 2 (D) 1

54. The standard reduction potentials of Fe^{3+}, Fe^{2+}/Pt and Fe^{2+}/Fe electrodes at 25°C are +0.771V and – 0.440V respectively. The standard emf of the cell in which the following reaction takes place is

$Fe + 2Fe^{3+} \rightarrow 3Fe^{2+}$

(A) + 0.331 V (B) – 0.331 V

(C) – 1.211 V (D) +1.211 V

55. Assertion (A) : The pH of aqueous solution of NaCl is 7.0

Reason (R) : Aqueous solutions of all salts are neutral.

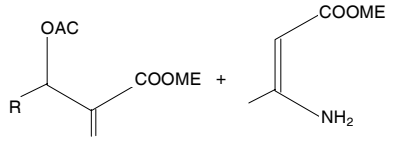
(A) A and R are true and R is the correct explanation of A

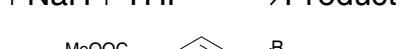
(B) A and R are true but R is not the correct explanation of A

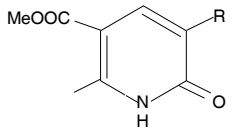
(C) A is true and R is false

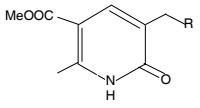
(D) A is false and R is true

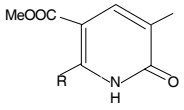
56. Predict the product formed under cyclization conditions

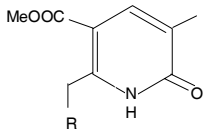




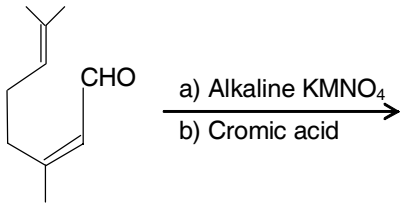
(A) 

(B) 

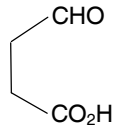
(C) 

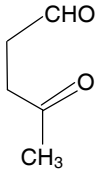
(D) 

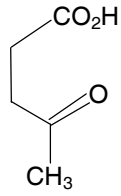
57. In the following reaction

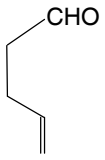


One of the products is

(A) 

(B) 

(C) 

(D) 

58. Match the following :

List – I (Compound)	**List – II (Nature)**
I. HCl	1. Conjugate base of NH_4^+
II. NH_3	2. Arrhenius base
III. $AlCl_3$	3. Conjugate acid of NH_4^+
IV. NaOH	4. Lewis acid
	5. Bronsted acid

	I	II	III	IV
(A)	3	1	5	2
(B)	5	3	4	2
(C)	4	1	5	2
(D)	5	1	4	2

59. Assertion (A) : CO is a strong ligand.

Reason (R) : It acts only as a σ donor.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

60. Which commercial product comes from cellulose ?

(A) Nylon (B) Rayon

(C) Dacron (D) Orlon

61. Assertion (A) : Cluster formation by a metal is inversely proportional to its effective nuclear charge.

Reason (R) : Nuclear charge contracts the metal orbitals meant for overlap.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

62. An enzyme enhances the rate of the reaction by

(A) Increasing the number of collisions between the reactants

(B) Increasing the velocity of the reacting molecules

(C) Providing energy to the reacting molecules

(D) Decreasing the activation energy of the reaction

63. Assertion (A) : The d^1 and d^8 systems have the same number of microstates.

Reason (R) : According to hole formalism, $d^n \equiv d^{10-n}$ where n is the number of electrons

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

64. For the photolysis of $HI \rightarrow H_2 + I_2$, the following mechanism is proposed

$HI + hv \rightarrow H. + I\cdot$

$H. + HI \rightarrow H_2 + I.$

$I. + I. \rightarrow I_2$

The quantum yield of this reaction is

(A) 0.5 (B) 1.0

(C) 2.0 (D) 4.0

65. Assertion (A) : ESR spectroscopy is not applicable for H_2 molecule.

Reason (R) : H_2 molecule contains a single bond between the H atoms.

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

66. 1, 2 – Disubstituted olefins having E/z isomerism can be identified by ^1H–nmr using

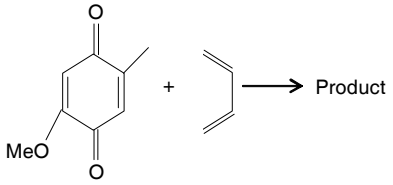
(A) Chemical shift

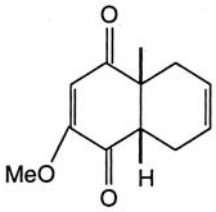
(B) Deutereum exchange

(C) Solvent

(D) Coupling constant

67. Predict the [4+2] Diels-Alder cycloaddition product with right stereochemistry



(A)


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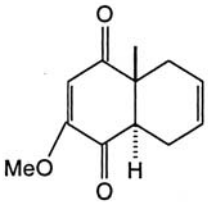

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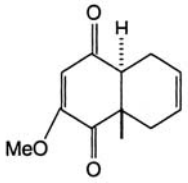
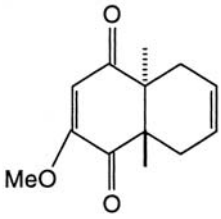


(D)


68. An electron of mass 'm' is confined to a one dimensional box of length 'l'. The frequency of the radiation absorbed during its excitation from its second energy level to third level is

(A) $\frac{5h}{8ml^2}$ (B) $\frac{h}{8ml^2}$

(C) $\frac{3h}{8ml^2}$ (D) $\frac{4h}{8ml^2}$

69. The rate of the reaction is _____ the number of activated molecules, when it is controlled by the steric factor.

(A) Greater than (B) Not related to

(C) Less than (D) Equal to

70. According to Wade's rules, structures of $B_{10}C_2H_{12}$ and $(B_9C_2H_{12})^{2-}$ are respectively

I. Closo II. Nido

III. Arachno IV. Hypho

(A) I, II (B) II, III

(C) I, IIII (D) II, IV

71. Assertion (A) : Both the complexes proceeding by dissociative mechanism, $[Co(NH_3)_4Cl_2]^+$ undergoes much faster acid hydrolysis reaction than $[Co(NH_3)_5Cl]^{2+}$

Reason (R) : The rate of loss of chloride decreases as charge on the complex increases.

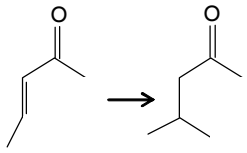
(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is not the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

72. Predict the reagent required for the regio-selective transformation (1, 4 – addition)



(A) Me Mg Br (B) MeLi

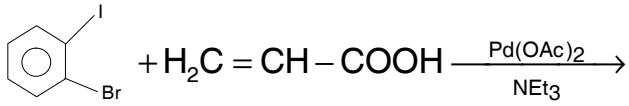
(C) [Me Mg Br + CuI] (D) LDA/MeI

73. Indicate the catalyst used in the Wacker reaction having industrial importance

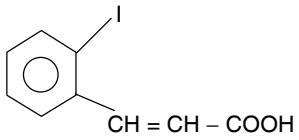
(A) Zn (B) Cd

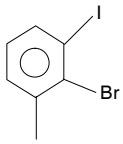
(C) Pd(II) (D) Hg

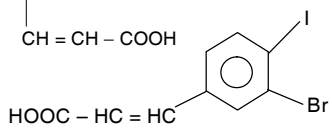
74. Inform the selectivity of product formed in the Heck reaction

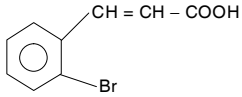


Product

(A) 

(B) 

(C) 

(D) 

75. The number of ESR signals formed in the spectrum of benzene anion radical is

(A) 5 (B) 6

(C) 7 (D) 8

CHEMICAL SCIENCES PAPER – III							
(SUBJECT CODE-02)							
Q.No	KEY		Q.No	KEY		Q.No	KEY
1	D		26	C		51	B
2	C		27	B		52	A
3	D		28	A		53	B
4	A		29	C		54	D
5	C		30	D		55	C
6	D		31	B		56	B
7	C		32	D		57	C
8	D		33	D		58	D
9	D		34	B		59	C
10	A		35	D		60	B
11	C		36	A		61	A
12	C		37	D		62	D
13	A		38	B		63	D
14	C		39	B		64	C
15	A		40	B		65	B
16	D		41	D		66	D
17	C		42	B		67	A
18	B		43	A		68	A
19	B		44	D		69	C
20	D		45	B		70	A
21	C		46	D		71	A
22	C		47	A		72	C
23	C		48	C		73	C
24	A		49	A		74	D
25	A		50	C		75	C