Paper - II

Chemical Science

Booklet Code

A

Test Booklet No.

SUBJECT CODE : 0 1

Roll No. : | | | | | | | | | | |

(Figures as per admission card)

Roll No. (in words) : _____

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OMR Sheet No. : | | | | | | | |

Name and Signature of Invigilator/s

Signature : _____

Name : _____

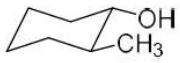
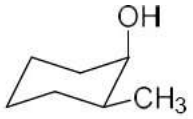
Time : 2 Hours | Maximum Marks : 200

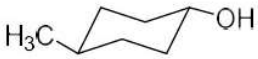
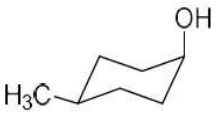
Number of Pages in this Booklet : 24 | **Number of Questions in this Booklet : 100**

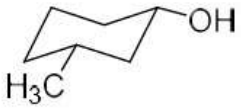
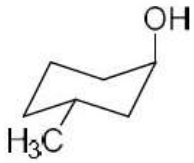
Instructions for the Candidates

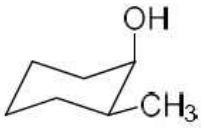
1. Write your roll number in the space provided on the top of this page.
2. This paper consists of hundred (100) multiple-choice type of questions.
3. At the commencement of examination, the test booklet will be given to you. In the first 5 minutes, you are requested **to open the booklet and compulsorily examine it as below:**
   (i) To have access to the Test Booklet, tear off the paper seal on the edge of the cover page. Do not accept a booklet without sticker seal or 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 Test Booklet will be replaced nor any extra time will be given.**
   (iii) After the 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 : Ⓐ Ⓑ ● Ⓓ
   where (C) is the correct response.
5. Your responses to the questions are to be indicated in the **OMR Sheet kept inside this Booklet**. If you mark at any place other than in the circles, the OMR Sheet will not be evaluated.
6. Read the instructions given in OMR Sheet carefully. Fill the Booklet Code of Paper-II in OMR Sheet **Compulsorily**.
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 provided for the relevant entries, which may disclose your identity, you will render yourself liable to disqualification.
9. You have to return the 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. You can take away test booklet and carbon copy of OMR Answer Sheet after the examination.
11. **Use only Blue/Black Ball point pen.**
12. **Use of any calculator, electronic gadgets or log table, etc. is prohibited.**
13. **There is no negative mark for incorrect answer.**

1. The heat of combustion of the *cis* isomer was larger than the *trans*. This argument is valid for two of the stereoisomeric pairs of 2-, 3-, and 4-methylcyclohexanols. Identify the pair of stereoisomers for which this assumption is incorrect:

(A)  and 

(B)  and 

(C)  and 

(D)  and 

2. In the coordination compound $[CoCl(NH_3)_5]Cl_2$,the primary valency is:

(A) 2

(B) 3

(C) 6

(D) 7

3. A compound crystallizes in an orthorhombic system having 2 molecules in a unit cell. The edge lengths of the unit cell a, b and c are 9.85, 13.02 and 4.12 Å, respectively. The molecular mass of the compound is (ρ= 1.123 g cm^{-3}):

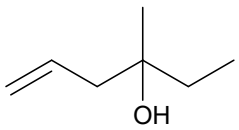
(A) 0.209 kg mol^{-1}

(B) 0.357 kg mol^{-1}

(C) 0.391 kg mol^{-1}

(D) 0.402 kg mol^{-1}

4. The correct IUPAC name of the following compound is :



(A) 3-Methyl-5-hexen-3-ol

(B) 4-Methyl-1-hexen-4-ol

(C) 4-Ethyl-4-methyl-but-1-en-4-ol

(D) 2-Propen-2-ethylethanol

5. The ground state of an octahedral Nickel(II) complex is:
   (A) ^3F
   (B) $^3A_{2g}$
   (C) $^3T_{2g}$
   (D) ^4F

6. Which of the following polyatomic molecules is an example of prolate symmetric top?
   (A) HCN
   (B) CH_2Cl_2
   (C) CH_3Cl
   (D) H_2O

7. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the code given below:

   Assertion (a): Alcohols can be methylated by diazomethane when irradiated with light.

   Reason(r): Because the diazomethane generates a carbenium ion, which is trapped by the alcohol.

   (A) Both (a) and (r) are true and (r) is correct explanation of (a).
   (B) Both (a) and (r) are true but (r) is not correct explanation of (a).
   (C) (a) is true, but (r) is false.
   (D) (a) is false, but (r) is true.

8. $KMnO_4$ is intensely colored. The reason for it is:
   (A) d-d transitions
   (B) Ligand to metal charge transfer transition
   (C) Metal to ligand charge transfer transition
   (D) Intervalence charge transfer transition

9. The selection rule for rotational Raman transitions for linear molecules is:
   (A) $\Delta J = 0, \pm 1$
   (B) $\Delta J = 0, \pm 2$
   (C) $\Delta J = 0, \pm 1, \pm 2$
   (D) $\Delta J = 0$

10. Match the entries in Columns (I) and (II) and select the correct answer from the codes given below:

	(Column -I)		(Column -II)
P	Molar absorptivity	1	Mass spectrometry
Q	DEPT	2	IR
R	Electrospray	3	^{13}C NMR
S	Hooke's law	4	UV-visible

Codes:

	P	Q	R	S
(A)	3	4	1	2
(B)	4	3	1	2
(C)	4	3	2	1
(D)	1	3	4	2

11. Which of the following is correct about the structure of Manganese pentacarbonyl?

(A) Tetranuclear

(B) Mononuclear

(C) Dinuclear

(D) Trinuclear

12. The J_{max} for a rigid diatomic molecule at 300 K is (B = 1.822 cm^{-1}):

(A) 7

(B) 8

(C) 6

(D) 9

13. Given below are two statements:

Statement (I): Conformations of a molecule are readily interconvertible, but are all the same molecules.

Statement (II): Changing the conformation of a molecule means breaking at least one bond.

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II) are incorrect.

(C) Statement (I) is correct and Statement (II) is incorrect.

(D) Statement (I) is incorrect and Statement (II) is correct.

14. Which of the following is correct answer for diborane?

(A) Four bridged and two terminal hydrogens are present

(B) Two bridged and four terminal hydrogens are present

(C) Three bridged and three terminal hydrogens are present

(D) One bridged and five terminal hydrogens are present

15. The point group of cyclooctatetraene and allene, respectively:

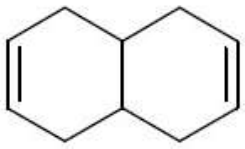
(A) D_{2d} and C_{2v}

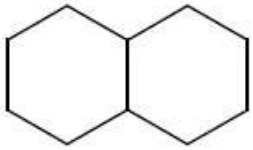
(B) D_{4d} and D_{2d}

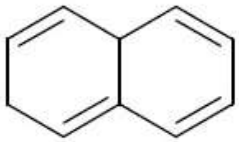
(C) Both have D_{2d}

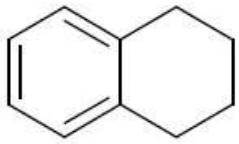
(D) Both have C_{2v}

16. 1,2-Dihydronaphthalene and 1,4-dihydronaphthalene have difference in the heat of hydrogenation (24.1 Kcal/mol and 27.1 Kcal/mol, respectively). Yet these produce a common product upon selective hydrogenation. Identify the product :

(A) 

(B) 

(C) 

(D) 

17. Which is the correct order of decreasing Lewis acidity of boron halides?

(A) $BBr_3 > BCl_3 > BF_3$

(B) $BF_3 > BCl_3 > BBr_3$

(C) $BCl_3 > BF_3 > BBr_3$

(D) $BBr_3 > BF_3 > BCl_3$

18. Units of rate constant for first and zero order reactions respectively, in terms of molarity (*M*)unit are:

(A) sec^{-1}, M sec^{-1}

(B) sec^{-1}, M

(C) M sec^{-1}, sec^{-1}

(D) M, sec^{-1}

19. Which of the following compounds is Chiral?

(A) (*Z*)-1,2-Dichloroethene

(B) (*E*)-1,2-Dichloroethene

(C) *cis*-1,2-Dichlorocyclopropane

(D) *trans*-1,2 Dichlorocyclopropane

20. Which of the following ring is present in Vitamin B_{12}?

(A) Porphyrin

(B) Phthalocyanine

(C) Crown ether

(D) Corrin

21. The rotational partition function of HCl at 250 K is (B = 10.59 cm^{-1}):

(A) 17.1

(B) 16.4

(C) 15.8

(D) 14.6

22. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the code given below:

Assertion (a) : Good nucleophiles have high-energy HOMOs.

Reason (r) : Good electrophiles have high-energy LUMOs so that the HOMO-LUMO gap is reduced.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

23. Shape of the triiodide ion is:

(A) Triangular

(B) Pyramidal

(C) Linear

(D) Square planar

24. In the rotational partition function of H_2 molecule, the population of ortho and para H_2 molecules have ratio:

(A) 2:1

(B) 4:3

(C) 5:2

(D) 3:1

25. Match the entries in Columns (I) and (II) and select the correct answer from the codes given below:

(Column -I)	(Column -II)
P. Hydride transfer	1. Benzidine rearrangement
Q. Hydrazobenzene	2. Benzoin condensation
R. Thiazolium ylide	3. Blanc Reaction
S. Chloromethylation	4. Cannizzaro Reaction

Codes:

	P	Q	R	S
(A)	1	2	4	3
(B)	4	1	3	2
(C)	4	1	2	3
(D)	3	1	2	4

26. Ziegler-Natta catalyst is associated with:

(A) Alkene polymerisation

(B) Hydroformylation of alkenes

(C) Alkene hydrogenation

(D) Alkyne metathesis

27. The technique used to investigate the shape of micelles is:

(A) Fluorescence spectroscopy

(B) Conductivity measurements

(C) Small angle neutron scattering

(D) Dynamic light scattering

28. Given below are two statements:

Statement (I): In converting toluene to 4-aminobenzoic acid nitration reaction is mandatory.

Statement (II): Minimum three functional group interconversions are needed in the question of statement (I).

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II) are incorrect.

(C) Statement (I) is correct and Statement (II) is incorrect.

(D) Statement (I) is incorrect and Statement (II) is correct.

29. Complex of which of the following metal ions is used as catalyst in Hydroformylation reaction?

(A) Manganese

(B) Nickel

(C) Iron

(D) Cobalt

30. The plot of amount adsorbed as a function of relative pressure corresponds to which type of adsorption isotherm?

(A) Type I

(B) Type III

(C) Type IV

(D) None of the above

31. While alcohols can be easily protected as alkyl ethers, but practically tetrahydropyranyl ethers are preferred. What is the most relevant reason?

(A) There are problems in deprotecting alkyl ethers

(B) Tetrahydropyran ether can be easily deprotected using a base

(C) Tetrahydropyran ether is susceptible to hydrolysis under acidic conditions

(D) Alkyl ethers are volatile

32. Which of the following metal hydroxide is least basic?

(A) $Ca(OH)_2$

(B) $Ba(OH)_2$

(C) $Sr(OH)_2$

(D) $Mg(OH)_2$

33. The work done by the engine working between 0 ºC and 155 ºC, if 2325 kJ of heat is supplied to it is:

(A) 850 kJ (B) 823 kJ

(C) 842 kJ (D) 832 kJ

34. Imagine you have a enantiomerically pure compound that has an [α]D of +10.0. Another sample of the same compound, which is chemically pure has an [α]D of +8.0. What is the enantiomeric excess?

(A) 80% (B) 90%

(C) 20% (D) 92%

35. In the reaction

$BH^+ + CH_3Hg^+ \leftrightarrow CH_3HgB^+ + H^+$

The base (B) may be regarded as:

(A) Hard

(B) Soft

(C) Amphoteric

(D) Borderline

36. The partial derivative $\left(\frac{\partial T}{\partial V}\right)_p$ is equal to:

A) $-\left(\frac{\partial P}{\partial S}\right)_T$ (B) $-\left(\frac{\partial P}{\partial S}\right)_V$

(C) $-\left(\frac{\partial P}{\partial S}\right)_n$ (D) $-\left(\frac{\partial P}{\partial S}\right)_H$

37. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : Both *cis* and *trans* dienophiles give same diastereoisomers of the product in Diels-Alder reaction.

Reason (r) : The Diels-Alder reaction is stereospecific.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

38. Which of the following is incorrect statement for Sulphuric acid?

(A) Higher viscosity than water.

(B) Solutes dissolve slowly in it.

(C) High vapour pressure.

(D) Difficult to remove from the crystallised materials.

39. The activation energy of a non-catalyzed reaction at 37°C is 83.68 kJ mol^{-1} and the activation energy of same reaction catalyzed by an enzyme is 25.10 kJ mol^{-1} .The catalyst increased the rate of the reaction by a factor of:

(A) 7.4×10^{10}

(B) 7.4×10^{9}

(C) 7.4×10^{8}

(D) 7.4×10^{7}

40. Match List-I and List-II and select the correct answer from the codes given below:

List-I(Synthons)		**List-II(Reagents)**
P.	R^+	1 Acetyl nitrite
Q.	H	2. HONO
R .	ArN_2^+	3. H_3PO_2
S.	Nitronium ion	4. Alkene + H^+

Codes:

	P	Q	R	S
(A)	3	4	1	2
(B)	4	3	1	2
(C)	4	2	3	1
(D)	4	3	2	1

41. Which of the following statement is correct?

(A) BH_3 is isolobal with $Cr(CO)_5$

(B) CH_3 is isolobal with $Os(CO)_4$

(C) CH_3 is isolobal with $[Ni(CO)_3]$

(D) CH_2 is isolobal with $Ir(CO)_3$

42. For the equilibrium

$SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$,

what is the temperature at which $\frac{K_p(atm)}{K_c(M)} = 4$?

(A) 2.01 K

(B) 51 K

(C) 48.72 K

(D) 0.48 K

43. Given below are two statements:

Statement (I): An enantiomerically pure compound can be used as a chiral auxiliary.

Statement (II): In the chiral auxiliary approach, enantioselective reaction is carried out. Because of the enantiomeric purity of the chiral auxiliary, only one enantiomer of the product is obtained.

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II) are incorrect.

(C) Statement (I) is correct and Statement (II) is incorrect.

(D) Statement (I) is incorrect and Statement (II) is correct.

44. The lowest energy absorption band in the UV-Vis spectrum of $[Ni(NH_3)_6]Cl_2$ complex corresponds to the transition:

(A) $^4F \rightarrow {}^4P$

(B) $^4A_{2g} \rightarrow {}^4E_g$

(C) $^3A_{2g} \rightarrow {}^3T_{2g}$

(D) $^2E_g \rightarrow {}^2T_{2g}$

45. The pK_a of an amino acid is 9.15. At what pH, amino acid is 6% dissociated?

(A) 9.15

(B) 7.93

(C) 2.18

(D) 1.17

46. A cycloaddition reaction is a one-step ring-forming reaction between two conjugated π-systems. Which of the following is not true about these reactions?

(A) In cycloaddition reactions two new σ bonds are formed.

(B) The cycloadditions are suprafacial.

(C) For thermally allowed cycloadditions, there should be 4n electrons in the mechanism.

(D) Cycloaddition equilibria generally lie on the right-hand side in a thermal reaction.

47. When CO is ionised to give CO^+, the electron goes from which molecular orbital?

(A) Antibonding

(B) Bonding

(C) Non-bonding

(D) pi- bonding

48. State of quantum mechanical system is completely defined by a function ψ, which :

I. has finite integral.

II. must be normalized.

III. has multiple-valued and continuous first derivative.

IV. single-valued and continuous first derivative.

Correct statements are:

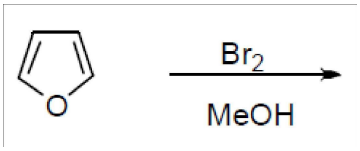
(A) Only (I) and (II)

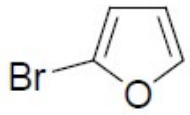
(B) Only (II) and (III)

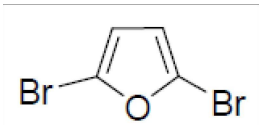
(C) Only (I), (II) and (IV)

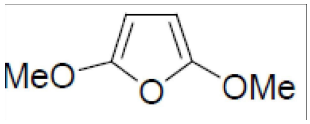
(D) Only (I), (III) and (IV)

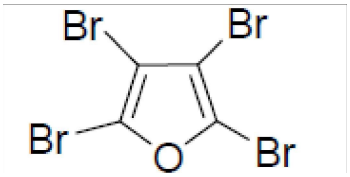
49. Considering the fact that furan has less resonance energy compared to benzene, predict the product in the following reaction :



(A) 

(B) 

(C) 

(D) 

50. Which of the following has the Metal-Metal quadruple bond?

(A) $Re_3Cl_9L_3$

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

(C) $Mo_6X_8^{4+}$

(D) $Re_2Cl_8^{2-}$

51. Which of the following functions is acceptable as eigen function along with its eigen value?

(A) $\frac{d(e^{-x})}{dx}, 1$

(B) $\frac{d^2(\cos x)}{dx^2}, 2$

(C) $\left(\frac{d}{dx}+\frac{d^2}{dx^2}\right)e^x, e^2$

(D) $-i\hbar\frac{d}{dx}\left(e^{\frac{-ix}{2\pi}}\right), \frac{-\hbar}{2\pi}$

52. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : While pyrrole reacts with electrophiles preferentially at C-2 position, indole reacts at C-3.

Reason (r) : When the electrophile attacks at the C-2 position of pyrrole, the aromaticity of the pyrrole ring is disrupted.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

53. Which is the correct statement for the hybridisation in CH_4 and MnO_4^- ?

(A) Both have sp^3 hybridisation.

(B) Both have sd^3 hybridisation.

(C) Both may have a mixture of sp^3 and sd^3 hybridisations.

(D) Both have dsp^2 hybridisation.

54. Let $\hat{A} = \frac{\partial}{\partial x}$ and $\hat{B} = x^3$, what will be the commutator $[\hat{A}, \hat{B}]$?

(A) 0

(B) $3x^2$

(C) 6x

(D) $6x^2 \frac{\partial}{\partial x} + 6x$

55. Match the entries in Columns (I) and (II) and select the correct answer from the codes given below:

(Column -I)		(Column -II)	
P.	Isoprene	1.	Alkaloid
Q.	Sanger	2.	Glucose
R.	Pyranose	3.	Peptide
S.	Yohimbine	4.	Terpene

Codes:

	P	**Q**	**R**	**S**
(A)	4	3	2	1
(B)	1	2	3	4
(C)	3	4	2	1
(D)	1	3	4	2

56. Ce^{3+} ions show strong absorption in the UV region because of:

(A) d-d transitions

(B) d-f transitions

(C) f-f transitions

(D) f-d transitions

57. Fundamental line in IR of $^{12}C^{16}O$ occurs at 2143 cm^{-1} and first overtone at 4260 cm^{-1}. Calculate value of dissociation energy (D_e) in cm^{-1} :

(A) 90472

(B) 92654

(C) 84088

(D) 168175

58. Given below are two statements:

Statement (I): The products of carbohydrate reduction are called Alditols.

Statement (II): Because the alditols lack a carbonyl group, these exist mainly as cyclic hemiacetals.

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II) are incorrect.

(C) Statement (I) is correct but Statement (II) is incorrect.

(D) Statement (I) is incorrect but Statement (II) is correct.

59. Which one of the following is the most stable (en=ethylenediamine)?

(A) $[Cu(en)_3]^{2+}$

(B) $[Ni(en)_3]^{2+}$

(C) $[Ni(en)_2(H_2O)_2]^{2+}$

(D) $[Cu(en)(H_2O)_4]^{2+}$

60. Which one of the following ground state term symbols does not relate to the corresponding electronic configuration?

(A) p^2, ^3P

(B) d^8, ^2F

(C) d^5, ^6S

(D) d^4, ^5D

61. A monosaccharide is treated with HCN, the resultant product is hydrolysed to a carboxylic acid, which is reduced by heating with HI and red P. What is the structure of the carboxylic acid if the monosaccharide was D-Erythrose?

(A) n-Hexanoic acid

(B) n-Pentanoic acid

(C) D-Glycaric acid

(D) n-Heptanoic acid

62. Which of the following metal element is a constituent of Plastocyanin?

(A) Zinc

(B) Molybdenum

(C) Iron

(D) Copper

63. Energy of HOMO of butadiene according to Huckel MO theory and number of nodes present in the orbital are:

(A) $\alpha+1.618\beta$, 1

(B) $\alpha-0.618\beta$, 1

(C) $\alpha+0.618\beta$, 1

(D) $\alpha+0.618\beta$, 0

64. The structure of the Skraup product from 3-bromo-4-aminotoluene and glycerol is :

(A) 6-Methyl-8-bromoquinoline

(B) 6-Methyl-8-bromoiso-quinoline

(C) 5-Methyl-7-bromoquinoline

(D) 5-Methyl-7-bromoiso-quinoline

65. Active site for dinitrogen binding in Vivo nitrogen fixation is:

(A) Molybdenum

(B) Magnesium

(C) Cobalt

(D) Nickel

66. Choose the correct option stating diatomic molecules in decreasing order of bond order :

(A) $O_2^+ > H_2 > He_2^+ > C_2 = O_2$

(B) $CN^- > O_2 > He_2^+ > Ne_2 = Be_2$

(C) $O_2^- > O_2^+ > C_2 = O_2 > F_2$

(D) $CN^- > He_2^+ > Ne_2 > Be_2$

67. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : o-Bromoanisole upon treatment with potassium amide yields m-aminoanisole.

Reason (r) : This due to *cine* substitution reaction on the reactive intermediate.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

68. Which of the following complexes is used as one of the chemotherapy medicine to treat cancer (py – pyridine)?

(A) $K[Fe_2(CN)_6]$

(B) $[Pt(py)_4]\,[PtCl_4]$

(C) *cis*-$[Pt(NH_3)_2Cl_2]$

(D) *trans*-$[Pt(NH_3)_2Cl_2]$

69. 0.0075 M aqueous solution of KCl shows resistance of 671 S^{-1}. What would be its molar conductance, given cell constant of 1 cm^{-1}?

(A) 0.198 S m^2 mol^{-1}

(B) 0.0198 S m^2 mol^{-1}

(C) 0.002 S m^2 mol^{-1}

(D) 1.98 S m^2 mol^{-1}

70. Match List-I and List-II and select the correct answer from the codes given below:

List-I (Compound)	**List-II** (Approx. Relative rates of bromination)
P. Benzene	1. 10^9
Q. N,N-Diethylaniline	2. 10^{15}
R. Anisole	3. 10^{14}
S. N,N-Dimethylaniline	4. 1

Codes:

	P	Q	R	S
(A)	3	4	1	2
(B)	4	3	1	2
(C)	4	2	1	3
(D)	1	3	4	2

71. In the reaction of Potassium permanganate and Sodium oxalate in the acidic medium, the oxidation state of manganese changes from:

(A) +VII to +II

(B) +V to +II

(C) +VI to +VII

(D) +II to +VII

72. Correct representation of Debye-Huckel-Onsager equation is:

(A) $\lambda_m = \lambda_m^0 - (A + B\lambda_m^0)\sqrt{C}$

(B) $\lambda_m = \lambda_m^0 - (A + B)\sqrt{C}$

(C) $\lambda_m = \lambda_m^0 - \sqrt{(A + B\lambda_m^0)C}$

(D) $\lambda_m = \lambda_m^0 - (A + B\lambda_m^0)C$

73. Given below are two statements:

Statement (I): The binding of crown ether and a metal cation is a host - guest complexation.

Statement (II): The interaction between host and guest in Statement (I) is best described as a non-covalent hydrogen bonding interaction.

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II) are incorrect.

(C) Statement (I) is correct but Statement (II) is incorrect.

(D) Statement (I) is incorrect but Statement (II) is correct.

74. Match List-I and List-II and select the correct answer from the codes given below:

List-I (Compound)

P. CH_4

Q. H_2O

R. NF_3

S. I_3^-

List-II(Bond angle)

1. 180°
2. 102° 30'
3. 104° 27'
4. 109° 28'

Codes:

	P	Q	R	S
(A)	4	2	3	1
(B)	4	1	2	3
(C)	4	3	2	1
(D)	1	3	2	4

75. Correctly match the properties in column (A) with expressions in column (B).

Column (A)

P. Temperature coefficient of EMF

Q. $\log(\gamma\pm)$

R. Debye length

S. Entropy change (ΔS)

Column (B)

1. $1/k$

2. $\left(\frac{\partial E}{\partial T}\right)_P$

3. $nF\left(\frac{\partial E}{\partial T}\right)_P$

4. $-A|z_+z_-|\sqrt{I}$

Codes:

	P	Q	R	S
(A)	3	4	1	2
(B)	2	4	1	3
(C)	4	2	3	1
(D)	1	2	3	4

76. The product of solvolysis of *tert*-butyl bromide in methanol proceeding via first-order kinetics is :

(A) $(CH_3)_3COH$

(B) $(CH_3)_3COCH_3$

(C) $(CH_3)_3CH$

(D) $(CH_3)_2CHOH$

77. Given below are two statements:

Statement (I): Both the d-d transitions and charge transfer transitions are governed by spin and Laporte selection rules.

Statement (II): Charge transfer transitions impart color to the complexes only if they absorb in the visible region of the spectrum.

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II) are incorrect.

(C) Statement (I) is correct and Statement (II) is incorrect.

(D) Statement (I) is incorrect and Statement (II) is correct.

78. The root mean square length of a random coiled polymer chain with N = 1000 and l = 150 pm is:

(A) 4.74 nm

(B) 47.4 nm

(C) 45.3 nm

(D) 4.53 nm

79. Which of the following alcohols would form 3-ethylhex-3-ene upon elimination of water?

(A) 3-Ethyl-3-pentanol

(B) 3-Ethyl-2-pentanol

(C) 3-Ethylhexan-2-ol

(D) 3-Ethylhexan-3-ol

80. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : Actinides (5f) are more prone to complex formation than lanthanides (4f).

Reason (r) : The 5f orbitals are more exposed into space in contrast to the 4f orbitals which are deeply buried, shielded by the outer orbitals and thus unable to take part in bonding.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

81. The value of correlation coefficient ranges between:

(A) 0 to 1

(B) –1 to 0

(C) –1 to +1

(D) 0 to 2

82. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : Fries rearrangement yields C-formylated phenols from phenyl benzoate.

Reason (r) : Phenyl benzoate forms acylium ion through $AlCl_3$ promoted cleavage of O-COPh bond.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

83. Match List-I and List-II and select the correct answer from the codes given below:

List-I (Complex)

P. $[NiCl_4]^{2-}$

Q. $[PtCl_4]^{2-}$

R. $[Co(ClO_4)(OAsMePh_2)_4]^{+}$

S. $Hg[Co(NCS)_4]$

List-II-(Geometry/structure)

1. Square planar
2. Square pyramidal
3. Polymeric
4. Tetrahedral

Codes:

	P	Q	R	S
(A)	4	1	2	3
(B)	4	2	3	1
(C)	1	3	4	2
(D)	1	3	2	4

84. With every 10 ºC rise in temperature, the rate of a chemical reaction :

(A) Doubles

(B) Triples

(C) Gets half

(D) None of these

85. Match List-I and List-II and select the correct answer from the codes given below:

List-I - (Conversions/Reactions)

P. Conjugate addition to diethylmalonate

Q. Formation of 1-arylalkynes

R. Hydroboration of alkynes

S. Biological reductions

List-II - (Reagent/catalyst)

1. NADH
2. Pd(0)
3. Sodium ethoxide
4. Catecholborane

Codes:

	P	Q	R	S
(A)	1	2	3	4
(B)	4	3	1	2
(C)	4	1	2	3
(D)	3	2	4	1

86. For which of the following ground term in a tetrahedral complex, the orbital angular momentum contribution is expected:

(A) $^4T_1$

(B) $^3A_2$

(C) ^5E

(D) ^2E

87. The number of components and the degrees of freedom in an aqueous solution of acetic acid respectively are:

(A) 2 and 3

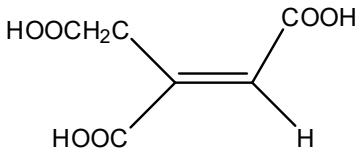
(B) 2 and 2

(C) 1 and 2

(D) 2 and 4

88. Given below are two statements:

Statement (I): The enzyme *aconitase* catalyzes the hydration of aconitic acid (shown below) to two products: citric acid and isocitric acid.



Statement (II) : While citric acid is optically active, isocitric acid is not.

In light of the above statements, choose the most appropriate answer from the codes given below:

(A) Both Statement (I) and Statement (II) are correct.

(B) Both Statement (I) and Statement (II)are incorrect.

(C) Statement (I) is correct but Statement (II) is incorrect.

(D) Statement (I) is incorrect but Statement (II) is correct.

89. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : Nickel is determined gravimetrically by precipitating it as Nickel dimethylglyoximate complex from the solution.

Reason(r): Nickel dimethyglyoximate complex is diamagnetic.

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

90. The entropy change upon heating of one mole of helium gas (assuming ideal) from 298 K to 1000 K at constant pressure is:

(A) 251.7 J K^{-1} mol^{-1}

(B) 25.17 J K^{-1} mol^{-1}

(C) 50.34 J K^{-1} mol^{-1}

(D) 503.4 J K^{-1} mol^{-1}

91. Which nanomaterial is used in LED displays ?

(A) $ZnOZrO_2$

(B) ZnO

(C) Indium gallium nitride

(D) Barium chloride

92. Which of the following gases is the most toxic to human haemoglobin?

(A) NO_2

(B) CO

(C) CO_2

(D) SO_2

93. Ampicillin trihydrate is a :

(A) β – Lactone antibiotic drug

(B) β – Lactam antibiotic drug

(C) β – Lactone analgesic drug

(D) β – Lactam antipyretic drug

94. Match the entries in Columns (I) and (II) and select the correct answer from the codes given below:

(Column -I)

P. Aggregation induced emission

Q. Lotus effect

R. Particulate matter

S. Enzyme inhibitor

(Column -II)

1. Medicinal Chemistry
2. Environmental
3. Nanotechnology
4. Supramolecular

Codes:

	P	Q	R	S
(A)	3	1	2	4
(B)	2	1	4	3
(C)	3	2	1	4
(D)	4	3	2	1

95. Given below are two statements, one labelled as Assertion (a) and the other labelled as Reason (r). Read the statements and choose the correct answer from the codes given below:

Assertion (a) : J-Aggregates are characterized by narrow and intense absorption bands.

Reason (r) : J-Aggregates lead to blue shift of the absorption band.

Codes:

(A) Both (a) and (r) are true and (r) is correct explanation of (a).

(B) Both (a) and (r) are true and (r) is not correct explanation of (a).

(C) (a) is true, but (r) is false.

(D) (a) is false, but (r) is true.

96. The diameter of single walled carbon nanotubes is :

(A) 0.5 – 2.0 nm

(B) 5 – 20 nm

(C) 0.05 – 0.2 nm

(D) 2.0 – 5.0 nm

97. Ozone is an important constituent of the stratosphere because it :

(A) Destroys bacteria in the atmosphere

(B) Give protection from harmful UV radiations

(C) Allows UV radiations to reach earth

(D) Prevent formation of Tyndall effect

98. Disease caused by eating fish containing mercury waste is called :

(A) Yamamoto

(B) Sickle cell anemia

(C) Minamata

(D) Osteoschlerosis

99. Ionic liquids have low lattice enthalpy because of :

(A) Asymmetric nature of ions

(B) Inefficient packing of ions

(C) Delocalization of charge

(D) All of the above

100. The product of Aldolase catalyzed reaction of enol of dihydroxyacetone phosphate and glyceraldehyde – 3-phosphate is :

(A) Glucose – 1,6 – biphosphate

(B) Fructose monophosphate

(C) Fructose – 1, 6 – biphosphate

(D) Fructose – 1, 4 = biphosphate

ROUGH WORK

ROUGH WORK