A1

VERSION CODE

ELIGIBILITY/COMPETITIVE EXAM 2024

PAPER-2

Total Number of Questions: 100

Maximum Marks : 200

Serial Number :

MENTION YOUR REGISTER NUMBER

Subject: CHEMISTRY

INSTRUCTIONS FOR CANDIDATES

DOs:

1. This question booklet is issued to you at **9.55 a.m.** by the room invigilator.
2. Check whether the Register Number has been entered and shaded in the respective circles on the OMR answer sheet.
3. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should also be entered on the Nominal Roll without any mistakes.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DONTs:

- **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. In case of usage of signs and symbols in the questions, the regular textbook connotation should be considered unless stated otherwise.
2. This question booklet contains **100** questions and each question will have one statement and four different options / responses & out of which you have to choose one correct answer.
3. At **10.00 a.m.** remove the paper seal of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet within **5** minutes of the commencement of exam. Read each item and start answering on the OMR answer sheet.
4. Completely **darken / shade** the relevant circle with a **blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

ಸರಿಯಾದ ಕ್ರಮ CORRECT METHOD				ತಪ್ಪು ಕ್ರಮಗಳು WRONG METHODS											
①	●	③	④	⊗	②	③	④	①	②	③	④	①	●	●	④
				●	②	③	④	①	●	③	④	①	②	③	④

5. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
6. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
7. **Once the last Bell rings at 1.00 P.M.,** stop writing on the OMR answer sheet and hand over the **OMR answer sheet** to the room invigilator as it is.
8. After separating the top sheet (Office copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you.
9. All questions carry equal marks.
10. Use of Mobile Phones, Calculators and other Electronic / Communication gadgets of any kind is prohibited inside the Examination venue.

1. Choose the correct statement(s) with respect to Zn^{2+} and Mg^{2+} separation :

(i) Mixtures of Zn^{2+} and Mg^{2+} are usually separated using anion exchanger rather than cation exchanger.

(ii) Zn^{2+} can be absorbed from hydrochloric acid solutions on anion exchanger resins due to the formation of negatively charged chloro complexes.

(iii) Zn^{2+} is eluted with dil. H_2SO_4 .

(1) Only (i)
(2) Only (ii)
(3) Only (i) and (ii)
(4) All three statements

2. In a typical DTA curve, broad endotherms and sharp endothermic peaks, respectively, indicate :

(1) Dehydration reactions and changes in crystallinity (or) fusion process
(2) Changes in crystallinity (or) fusion process and dehydration reactions
(3) Crystallization and melting
(4) Decomposition and glass transition

3. Carboxypeptidase contains :

(1) Zn(II) and hydrolyses CO_2
(2) Zn(II) and hydrolyses peptide bonds
(3) Mg(II) and hydrolyses CO_2
(4) Mg(II) and hydrolyses peptide bonds

4. Which of the given drugs is ***not*** a metallo drug to treat against cancer ?

(1) Carboplatin
(2) Doxorubicin
(3) Oxaliplatin
(4) Cisplatin

SPACE FOR ROUGH WORK

5. The C – N stretching frequency, ν(CN), of the complexes $[V(CN)_6]^{5-}$, $[V(CN)_6]^{4-}$ and $[V(CN)_6]^{3-}$ increases in the order :

(1) $[V(CN)_6]^{5-} < [V(CN)_6]^{4-} < [V(CN)_6]^{3-}$

(2) $[V(CN)_6]^{5-} < [V(CN)_6]^{3-} < [V(CN)_6]^{4-}$

(3) $[V(CN)_6]^{3-} < [V(CN)_6]^{4-} < [V(CN)_6]^{5-}$

(4) $[V(CN)_6]^{3-} < [V(CN)_6]^{5-} \leq [V(CN)_6]^{4-}$

6. Bromine NQR spectrum of K_2TeBr_6 will show :

(1) 2 lines (2) 3 lines

(3) 4 lines (4) 6 lines

7. Of the following, the compounds that show two signals in ^{19}F NMR spectra are :

(i) SF_6 (ii) SF_4

(iii) ClF_5 (iv) $XeOF_4$

(1) (i) and (ii) (2) (i) and (iii)

(3) (iii) and (iv) (4) (ii) and (iii)

8. The geometric cross-section (in barn) of a nucleus A = 125, $r_0 = 1{\cdot}4 \times 10^{-15}$m approximately is :

(1) 1·05 (2) 1·54

(3) 2·05 (4) 2·54

9. Isotones contain same number of :

(1) Protons (2) Electrons

(3) Neutrons (4) Mesons

10. Identify radioactive capture from the following nuclear reactions :

(1) $^{9}Be\ (\gamma, n)\ ^{8}Be$ (2) $^{23}Na\ (n, \gamma)\ ^{24}Na$

(3) $^{63}Cu\ (p, p\ 3n\ 9\alpha)\ ^{24}Na$ (4) $^{107}Ag\ (n, n)\ ^{107}Ag$

SPACE FOR ROUGH WORK

11. The correct statement about both average values of position (<x>) and momentum (<p>) of a 1-d harmonic oscillator wave function is :

(1) $\langle x \rangle \neq 0$ and $\langle p \rangle \neq 0$

(2) $\langle x \rangle = 0$ but $\langle p \rangle \neq 0$

(3) $\langle x \rangle = 0$ and $\langle p \rangle = 0$

(4) $\langle x \rangle \neq 0$ but $\langle p \rangle = 0$

12. The ionization energy of hydrogen atom in its ground state is approximately 13·6 eV. The potential energy of He^+, in its ground state is approximately :

(1) – 54·4 eV (2) – 27·2 eV

(3) – 13·6 eV (4) – 108·8 eV

13. Which of the following statements on ground state perturbation theory, involving the zeroth order energy $E_0^{(0)}$, first order energy correction $E_0^{(1)}$ and second order energy correction $E_0^{(2)}$, is false ?

(1) $E_0^{(1)}$ is the average value of perturbation operator with respect to the ground state of the zeroth-order Hamiltonian.

(2) $E_0^{(1)}$ is necessarily negative.

(3) $E_0^{(2)}$ is necessarily negative.

(4) $E_0^{(0)} + E_0^{(1)}$ is an upper bound to the exact ground state energy.

14. For some one-electron system with $l = 0$ and $m = 0$, the functions $N_0 e^{-\sigma}$ and $N_1(2 - \sigma)\, e^{-\sigma/2}$ refer respectively to the ground (ε_0) and first excited (ε_1) energy levels. If a variational wave function $N_2(3 - \sigma)\, e^{-\sigma}$ yields an average energy $\bar{\varepsilon}$, it will satisfy :

(1) $\bar{\varepsilon} \geq 0$ (2) $0 \leq \bar{\varepsilon} \leq \varepsilon_0$

(3) $\bar{\varepsilon} \geq \varepsilon_1$ (4) $\varepsilon_0 \leq \bar{\varepsilon} \leq \varepsilon_1$

SPACE FOR ROUGH WORK

15. The electronic configuration for Gadolinium (Gd) is [Xe] $4f^7 5d^1 6s^2$, whereas that of Gd^{2+} is :

(1) [Xe] $4f^5 5d 6s^2$ (2) [Xe] $4f^6 6s^2$

(3) [Xe] $4f^6 5d^1 6s^1$ (4) [Xe] $4f^7 5d^1$

16. Which of the following statements is ***incorrect*** ?

(1) A Slater determinant is an antisymmetrized wave function.

(2) Electronic wave function should be represented to Slater determinants.

(3) A Slater determinant always corresponds to a particular spin state.

(4) A Slater determinant obeys Pauli's exclusion principle.

17. The highest occupied MO in N_2 and O_2^+ respectively are : (take x-axis as internuclear axis)

(1) σ_{2p_x} , $\pi^*_{2p_y}$ (2) π_{2p_y} , π_{2p_z}

(3) $\sigma^*_{2p_x}$, σ_{2p_x} (4) $\pi^*_{2p_y}$, $\pi^*_{2p_z}$

18. The energy levels for cyclobutadiene are $\alpha + 2\beta$, α, α and $\alpha - 2\beta$. The delocalization energy in this molecule is :

(1) 0 (2) -4β

(3) -8β (4) 4α

19. The product of the symmetry elements $C_{2(z)} \times \sigma_{xz}$ is equal to :

(1) σ_{yz} (2) $\sigma_{2(z)}$

(3) E (4) σ_{xz}

20. The point group of the Ferrocene (staggered) is :

(1) D_5 (2) D_{5h}

(3) D_{5d} (4) D_{4h}

SPACE FOR ROUGH WORK

21. If the component of the orbital angular momentum along the molecular axis of a heteronuclear diatomic molecule is non-zero, the rotational-vibrational spectrum will show :

(1) P and R branches only
(2) P and Q branches only
(3) Q and R branches only
(4) All the branches P, Q and R

22. The number of rotational symmetry axes for triclinic crystal system is :

(1) 4
(2) 3
(3) 1
(4) 0

23. Which of the following properties are characteristic of an ideal solution ?

(i) $(\Delta_{mix} G)$ T, P is negative
(ii) $(\Delta_{mix} S)$ T, P is positive
(iii) $(\Delta_{mix} V)$ T, P is positive
(iv) $(\Delta_{mix} H)$ T, P is negative

(1) (i) and (iv)
(2) (i) and (ii)
(3) (i) and (iii)
(4) (iii) and (iv)

24. For a van der Waals gas, the partial derivative $\left(\frac{\delta U}{\delta V}\right)_T$ is :

(1) $\frac{V_m}{a}$
(2) $\frac{V_m^2}{a}$
(3) $\frac{a}{V_m^2}$
(4) $\frac{a}{V_m}$

25. The molar entropy of mixing of liquid 'A' with liquid 'B' is + R *ln* 2. The excess molar entropy of mixing 1·0 mol of liquid 'A' with 1·0 mol of liquid 'B' is :

(1) – 2 R *ln* 2
(2) + 4 R *ln* 2
(3) 0
(4) + R *ln* 2

SPACE FOR ROUGH WORK

26. The temperature-dependence of the vapour pressure of solid 'A' can be represented by $\log P = 10{\cdot}0 - \frac{1800}{T}$, and that of liquid 'A' by $\log P = 8{\cdot}0 - \frac{1400}{T}$. The temperature of the triple point of 'A' is :

(1) 200 K (2) 300 K (3) 400 K (4) 500 K

27. Though a constant shift of energy levels of a system changes the partition function, the properties that do ***not*** change are :

(1) Average energy, entropy and heat capacity

(2) Average energy and entropy

(3) Average energy and heat capacity

(4) Entropy and heat capacity

28. Four distinguishable molecules are distributed in energy levels E_1 and E_2 with degeneracy of 2 and 3, respectively. The number of microstates, with three molecules in energy level E_1 and one in energy level E_2 is :

(1) 4 (2) 12 (3) 96 (4) 192

29. For the following reaction

$$2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{2+} + 8H_2O + 10CO_2$$

$E^o(MnO_4^- / Mn^{2+}) = +1{\cdot}51\,V$ and $E^o(CO_2 / H_2C_2O_4) = -0{\cdot}49\,V$.

At 298 K, the equilibrium constant is :

(1) 10^{500} (2) 10^{338} (3) 10^{38} (4) 10^{833}

30. Ionic mobilities of NH_4^+ and HCO_3^- are 6×10^{-4} and $5 \times 10^{-4}\,V^{-1}\,cm^2\,s^{-1}$. Calculate the transport number of NH_4^+ and HCO_3^- respectively.

(1) 0·45, 0·55 (2) 0·40, 0·60

(3) 0·60, 0·40 (4) 0·55, 0·45

SPACE FOR ROUGH WORK

31. What is the concentration of the reactant in a first order reaction when the rate of the reaction is 0·6 s^{-1} and the rate constant is 0·035 ?

(1) 26·667 M (2) 17·143 M (3) 26·183 M (4) 17·667 M

32. What is the value of rate constant 'k' if the value of activation energy E_a and the frequency factor 'A' are 49 kJ/mol and $9 \times 10^{10}\ s^{-1}$ respectively ? (T = 313 K)

(1) $6 \times 10^{2}\ s^{-1}$ (2) $9 \times 10^{2}\ s^{-1}$

(3) $6 \times 10^{-2}\ s^{-1}$ (4) $3 \times 10^{2}\ s^{-1}$

33. Which of the following is ***not*** an example of heterogeneous catalysis ?

(1) Production of ammonia by Haber's process

(2) Oxidation of SO_2 into SO_3 during contact process

(3) Method of obtaining methanol from water gas

(4) Combustion of coal

34. The volume of gas absorbed on a solid surface is 10·0 mL, 11·0 mL, 11·2 mL, 14·5 mL and 22·5 mL at 1·0, 2·0, 3·0, 4·0 and 5·0 atm. pressure, respectively. These data are best represented by :

(1) BET isotherm (2) Gibbs isotherm

(3) Langmuir isotherm (4) Freundlich isotherm

35. The coordinates for the atoms in a body-centred cubic unit cell are :

(1) (0, 0, 0) and $(\frac{1}{2}, 0, 0)$ (2) (0, 0, 0) and $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$

(3) (0, 0, 0) and $(0, \frac{1}{2}, 0)$ (4) (0, 0, 0) and $(0, 0, \frac{1}{2})$

36. A compound of M and X atoms has a cubic unit cell. M atoms are at the corners and body centre position and X atoms are at the face centre positions of the cube. The molecular formula of the compound is :

(1) MX (2) MX_2 (3) M_3X_2 (4) M_2X_3

SPACE FOR ROUGH WORK

37. The number-average molar mass ($\overline{M}_n$) and weight-average molar mass ($\overline{M}_w$) of a polymer are obtained respectively by :

(1) Osmometry and light scattering measurements

(2) Osmometry and viscosity measurements

(3) Light scattering and sedimentation measurements

(4) Viscosity and light scattering measurements

38. The addition polymerization of M (monomer) involves the following stages :

(I = initiator, R = free radical)

$$I \xrightarrow{k_1} R$$

$$R + M \xrightarrow{k_2} RM$$

$$RM + M \longrightarrow RM_2 \text{ and so on}$$

$$RM_n + M_{n'}\ R \xrightarrow{k_3} R - M_n - M_{n'} - R.$$

The rate constant for free radical formation is $2 \times 10^{-3}\ s^{-1}$. The initial concentration of initiator is 10^{-3} mol dm^{-3}. The overall rate of the reaction is 4×10^{-3} mol $dm^{-3}\ s^{-1}$. Assuming steady state approximation for free radical, the kinetic chain length is :

(1) 2000 (2) 8×10^9 (3) 20 (4) 200

39. In a titration, the percentage uncertainties in the measured aliquot volume and the measured titre volume are ± x and ± y respectively. The percentage error in the calculated concentration of aliquot is :

(1) x + y (2) xy

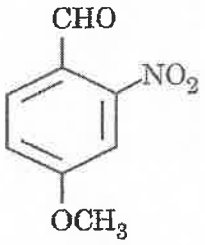
(3) $(xy)^{1/2}$ (4) $(x^2+y^2)^{1/2}$

40. The repeated measurements of lead (Pb) in a lake water sample gave 3·2, 5·2 and 7·2 ppb of Pb. The standard deviation in the measurement of Pb is :

(1) 2 ppb (2) 4 ppb (3) 0 ppb (4) $2\sqrt{2}$ ppb

SPACE FOR ROUGH WORK

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



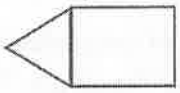
(1) 4-formyl-3-nitroanisole

(2) 4-methoxy-3-nitrobenzaldehyde

(3) 4-methoxy-6-nitrobenzaldehyde

(4) 2-formyl-5-methoxynitrobenzene

42. The IUPAC name of the following compound is :



(1) Bicyclo [2.1.0] pentane

(2) Bicyclo [0.1.2] pentane

(3) 1, 2-cyclopropylbutane

(4) None of the above

43. (Z)-but-2-ene reacts with Br_2 in CCl_4 to give :

(1) (2R, 3S)-2, 3-dibromobutane

(2) (2R, 3R)-2, 3-dibromobutane

(3) (2S, 3S)-2, 3-dibromobutane

(4) (2R, 3R) and (2S, 3S)-2, 3-dibromobutanes in equal amounts

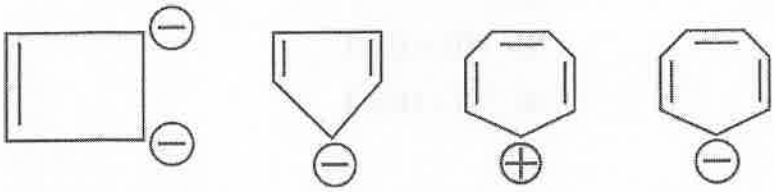
SPACE FOR ROUGH WORK

44. A molecule with n chiral centres can have a maximum of _____ stereoisomers.

(1) 2n (2) n

(3) 2^n (4) n^2

45. Which of the following ions exhibit aromaticity ?



(I) (II) (III) (IV)

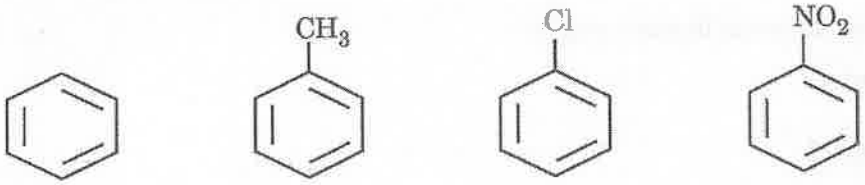
(1) II, III and IV

(2) I, II and III

(3) I, III and IV

(4) I, II, III and IV

46. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds :



(I) (II) (III) (IV)

(1) I > II > III > IV

(2) IV > III > II > I

(3) II > I > III > IV

(4) II > III > I > IV

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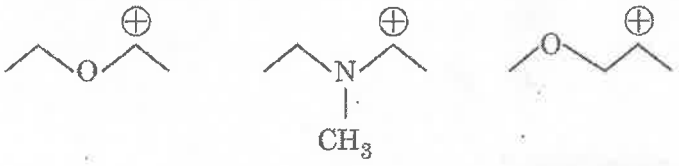
47. Which of the following orders is correct for the stability of these carbocations ?

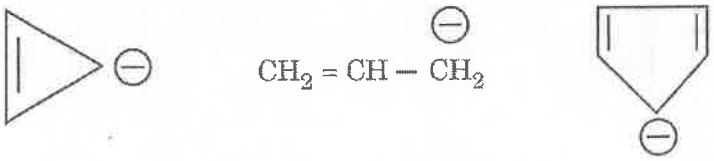


(I) (II) (III)

(1) I > II > III (2) III > II > I

(3) II > I > III (4) II > III > I

48. Which of the following orders is correct for the stability of these carbanions ?



(I) (II) (III)

(1) I > II > III (2) III > II > I

(3) I > III > II (4) II > III > I

49. Which of the following carbenes is more stable ?

(1) CH_2 (singlet)

(2) CH_2 (triplet)

(3) Both are equally stable

(4) Stability of carbenes is unpredictable

50. Which of the following can ***not*** react as a nucleophile ?

(1) CH_3NH_2 (2) $(CH_3)_2NH$

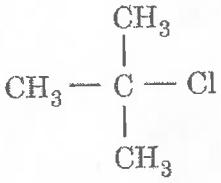
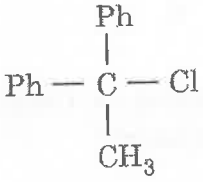
(3) $(CH_3)_3N$ (4) $(CH_3)_4N^+$

SPACE FOR ROUGH WORK

51. Electrophilic aromatic substitution proceeds through a :

(1) Free radical
(2) Sigma complex
(3) Benzene
(4) Carbene

52. Which of the following will undergo S_N1 reaction at a faster rate ?

(1) 
(2) CH_3-CH_2-Cl
(3) CH_3-Cl
(4) 

53. Which of the following catalysts is used in Sommelet–Hauser rearrangement ?

(1) Alkali metal amide
(2) Sodium hydroxide
(3) Potassium hydroxide
(4) Aluminium chloride

54. Name the following rearrangement reaction :

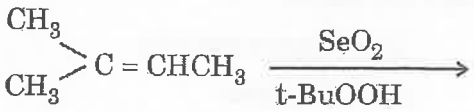
(1) Smiles
(2) Sommelet-Hauser
(3) Stevens
(4) Von-Richter

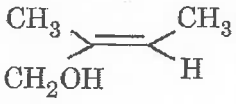
55. The starting material in McMurry olefination reaction is :

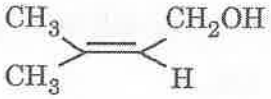
(1) an alkene
(2) a carbonyl compound
(3) an amine
(4) a dienophile

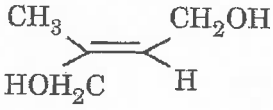
SPACE FOR ROUGH WORK

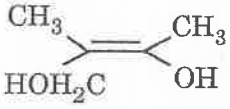
56. What will be the major product of the following reaction ?



(1) 

(2) 

(3) 

(4) 

57. An organic compound on Ozonolysis yields formaldehyde as one of the products. This confirms the presence of :

(1) a methyl group
(2) a vinyl group
(3) a C ≡ C bond
(4) two ethylenic double bonds

58. The BOC group is the abbreviation of which of the following protecting group ?

(1) Tertiary butyloxycarbonyl group
(2) Benzyloxy group
(3) Benzoyl group
(4) Benzyloxycarbonyl group

59. The correct synthetic equivalent for the synthon $\overset{\oplus}{NO}$ is :

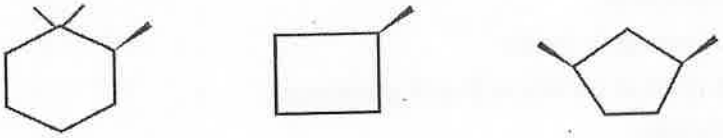
(1) HNO_3
(2) Conc. HNO_3 + Conc. H_2SO_4
(3) $NaNO_2$ / HCl
(4) $NaNO_3$

60. The reagent used in Sharpless Asymmetric Epoxidation is :

(1) Anhydrous $AlCl_3$
(2) p-Chloroperbenzoic Acid
(3) Titanium tetra-isopropoxide
(4) DCC

SPACE FOR ROUGH WORK

61. Which of the following compound(s) is/are chiral ?



(A) (B) (C)

(1) Only (A) and (B)

(2) Only (B)

(3) Only (B) and (C)

(4) Only (A)

62. Give the name of the following molecular orbital of the five carbon system :

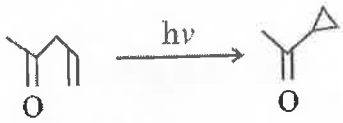
(1) ψ_1

(2) ψ_2

(3) ψ_3

(4) ψ_4

63. Name the following reaction :



(1) Norrish type I reaction

(2) Norrish type II reaction

(3) Oxa-di-π-methane rearrangement

(4) Paternò-Büchi reaction

64. If n-parallel atomic p-orbitals overlap in a π manner in a monocyclic array, the lowest molecular orbital has no nodes and it is called :

(1) Aromatic system

(2) Anti-aromatic system

(3) Hückel system

(4) Möbius system

SPACE FOR ROUGH WORK

65. Which of the following statements is ***incorrect*** ?

(1) Furan is more reactive than pyrrole.

(2) Some pyrimidines are found in nucleic acids.

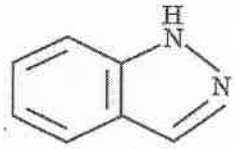
(3) Electrophilic substitution in pyrrole occurs in 2 or 5 positions.

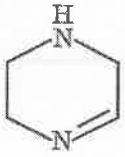
(4) Pyridine is less basic than pyrrole.

66. The structure of pyridazine is :

(1) 

(2) 

(3) 

(4) 

67. Digitonin is a _____.

(1) Lipid (2) Protein (3) Glycoside (4) Alkaloid

68. The reagent used in von Braun method is :

(1) BrCN (2) HCN (3) NaCN (4) CH_3CN

69. A metastable ion has :

(1) Lower kinetic energy than normal ions

(2) Higher kinetic energy than normal ions

(3) Lower potential energy than normal ions

(4) Higher potential energy than normal ions

70. If the chemical shift difference is equal or slightly higher than coupling constant J, which of the following will occur ?

(1) A first order spectra (2) A non-first order spectra

(3) AX spectra (4) Simplified spectra

SPACE FOR ROUGH WORK

71. Which technique is commonly used to visualize and manipulate individual atoms and molecules on surfaces ?

(1) X-ray crystallography

(2) Scanning electron microscopy

(3) Transmission electron microscopy

(4) Scanning tunneling microscopy

72. What is the term for a material that conducts electricity only in one or two dimensions at the nanoscale ?

(1) Nanowire

(2) Nanotube

(3) Nanorod

(4) Nanoplatelet

73. Which one of the following is an example of homogeneous catalysis ?

(1) Haber process of synthesis of ammonia

(2) Catalytic conversion of SO_2 to SO_3 in contact process

(3) Catalytic hydrogenation of oils

(4) Acid hydrolysis of methyl acetate

74. The elements which are good catalysts and can change their oxidation number are :

(1) Noble elements

(2) Alkalis

(3) Transition elements

(4) Acids

75. Which term describes the proportion of a drug that enters the systemic circulation and is available to produce an effect ?

(1) Bioavailability

(2) Absorption

(3) Distribution

(4) Metabolism

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76. What is the main function of beta-blockers in the body ?

(1) Increase heart rate

(2) Dilate blood vessels

(3) Lower blood pressure

(4) Enhanced blood clotting

77. Molecular cages capable of trapping guest molecules are known as :

(1) Fullerenes

(2) Zeolites

(3) Calixarenes

(4) Rotaxanes

78. Which of the following is ***not*** a commonly used supramolecular host molecule ?

(1) Crown ether

(2) Cucurbituril

(3) Carboxylic acid

(4) Calixarenes

79. The region which is greatly affected by air pollution is :

(1) Stratosphere (2) Mesosphere

(3) Thermosphere (4) Troposphere

80. Which among the following is the main source of soil and water pollution ?

(1) Mining

(2) Agro-industry

(3) Thermal power stations

(4) Fishing

SPACE FOR ROUGH WORK

81. The correct order of decreasing electronegativity of the following atoms is :

(1) As > Al > Ca > S
(2) Al > Ca > S > As
(3) S > As > Al > Ca
(4) S > Ca > As > Al

82. The correct order of the size of S, S^{2-}, S^{2+} and S^{4+} species is :

(1) $S > S^{2+} > S^{4+} > S^{2-}$
(2) $S^{2-} > S > S^{2+} > S^{4+}$
(3) $S^{2+} > S^{4+} > S^{2-} > S$
(4) $S^{4+} > S^{2-} > S > S^{2+}$

83. The geometry and the shape of ICl_3 molecule is :

(1) Trigonal pyramidal and bent
(2) Trigonal planar and bent
(3) Octahedral and T-shape
(4) Trigonal bipyramidal and T-shape

84. The molecule that possesses dipole moment is :

(1) SF_4
(2) CCl_4
(3) XeF_4
(4) PCl_5

85. According to Bent's rule, the correct geometry around P atom and position of fluorine in PCl_3F_2 is respectively :

(1) TBP and equatorial
(2) Square pyramidal and axial
(3) Square pyramidal and equatorial
(4) Trigonal bipyramidal and axial

86. SbF_5 in HF is regarded as a :

(1) Strong acid
(2) Strong base
(3) Weak acid
(4) Weak base

87. The pH of 1×10^{-7}N solution of HCl is :

(1) 4·5
(2) 5·9
(3) 6·7
(4) 7·0

SPACE FOR ROUGH WORK

88. The fragment which is isolobal with $\left[Re(CO)_5\right]$ is :

(1) CH (2) CH_2

(3) CH_3 (4) CH_4

89. The hybridization of Nitrogen and Phosphorus in Phosphazene is :

(1) sp^2 and sp^3 (2) sp and sp^2

(3) sp and sp^3 (4) sp^2 and sp

90. Acetic acid exerts the following effect on the acidic behaviour of HX (X = Cl, Br and I) :

(1) Levelling effect

(2) Neutralization effect

(3) Differentiating effect

(4) Solvation effect

91. In the first transition series, the paramagnetism is due to unpaired spins being approximately equal to $\mu = 2\sqrt{S(S+1)}$ Magnetons, where S = total spin. On the basis of this, Cu^+ ion has the magnetic moment of :

(1) Zero Magneton (2) 1·41 Magneton

(3) 2·83 Magneton (4) 3·88 Magneton

92. Which one of the following Co(III) complexes has the highest rate of acid hydrolysis at pH = 1 ?

(1) trans-$\left[Co(NH_3)_4Cl_2\right]^+$

(2) trans-$\left[Co(en)(NH_3)_2Cl_2\right]^+$

(3) trans-$\left[Co(en)_2Cl_2\right]^+$

(4) cis-$\left[Co(NH_3)_4Cl_2\right]^+$

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93. Which one among the following complexes is an outer orbital octahedral complex ?

(1) $\left[Cr(H_2O)_6\right]^{2+}$

(2) $\left[Cr(NH_3)_6\right]^{3+}$

(3) $\left[Co(NH_3)_6\right]^{3+}$

(4) $\left[Fe(CN)_6\right]^{3-}$

94. UV–Vis absorption band positions of lanthanide ions do ***not*** change with various ligands because :

(1) of incompletely filled f-shell

(2) crystal field splitting is less

(3) f-shell is well shielded from ligand field

(4) of Laporte-forbidden f-f transition

95. Rare earth tris-chelates of β-diketonate derivatives cause :

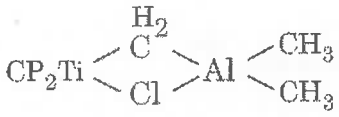
(1) Large pseudocontact shifts in Lewis acids

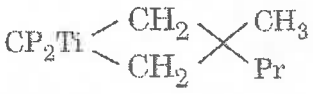
(2) Large pseudocontact shifts in Lewis bases

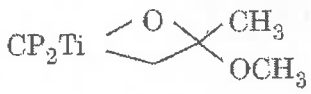
(3) Spin-Spin decouplings

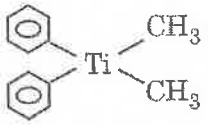
(4) Decrease in second order (Δ) splitting than first order (J) splitting

96. The Petasis reagent is :

(1) 

(2) 

(3) 

(4) 

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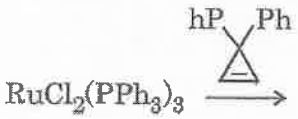
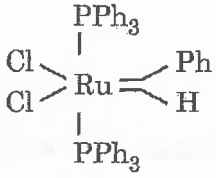
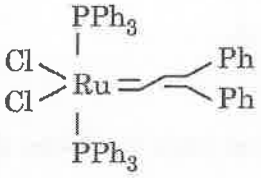
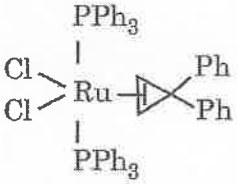
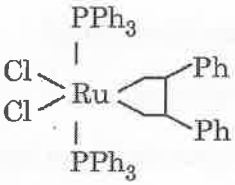
97. Complete the reaction with suitable answer as given below :



(1) 

(2) 

(3) 

(4) 

98. Which among the following alkene will bind most strongly to a metal ?

(1) Cyclooctadiene (2) Ethylene

(3) Norbornene (4) Cyclohexene

99. When diborane (B_2H_6) is heated at 100°C in a sealed tube, it gives :

(1) B_5H_9 (2) $B_{10}H_{14}$

(3) B_4H_{10} (4) B_5H_{11}

100. When $\left[Ni_6(CO)_{12}\right]^{2-}$ is heated with $FeCl_3$, it will form :

(1) $\left[Ni_9(CO)_{18}\right]^{2-}$ (2) $\left[Ni_9C(CO)_{16}\right]^{2-}$

(3) $\left[Ni_9C(CO)_{17}\right]^{2-}$ (4) $\left[Ni_9C(CO)_{18}\right]^{2-}$

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