

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet Series

T. B. C. : PGT – 3/17

A

TEST BOOKLET

PART – B
(CHEMISTRY)

Serial No. 3009

Time Allowed : 2 Hours

Maximum Marks : 100

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET OF THE SAME SERIES ISSUED TO YOU.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES A, B, C OR D, AS THE CASE MAY BE, IN THE APPROPRIATE PLACE IN THE ANSWER SHEET USING BALL POINT PEN (BLUE OR BLACK).
3. You have to enter your **Roll No.** on the Test Booklet in the Box provided alongside. DO NOT write *anything else* on the Test Booklet.
4. YOU ARE REQUIRED TO FILL UP & DARKEN ROLL NO., TEST BOOKLET / QUESTION BOOKLET SERIES IN THE ANSWER SHEET AS WELL AS FILL UP TEST BOOKLET / QUESTION BOOKLET SERIES AND SERIAL NO. AND ANSWER SHEET SERIAL NO. IN THE ATTENDANCE SHEET CAREFULLY. WRONGLY FILLED UP ANSWER SHEETS ARE LIABLE FOR REJECTION AT THE RISK OF THE CANDIDATE.
5. This Test Booklet contains 100 items (questions). Each item (question) comprises four responses (answers). You have to select the correct response (answer) which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct response (answer), you should mark (darken) the response (answer) which you consider the best. In any case, choose **ONLY ONE** response (answer) for each item (question).
6. You have to mark (darken) all your responses (answers) **ONLY** on the **separate Answer Sheet** provided by using **BALL POINT PEN (BLUE OR BLACK)**. See instructions in the Answer Sheet.
7. All items (questions) carry equal marks. All items (questions) are compulsory. Your total marks will depend only on the number of correct responses (answers) marked by you in the Answer Sheet. **There will be no negative markings for wrong answers.**
8. Before you proceed to mark (darken) in the Answer Sheet the responses to various items (questions) in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions sent to you with your **Admission Certificate**.
9. After you have completed filling in all your responses (answers) on the Answer Sheet and after conclusion of the examination, you should hand over to the Invigilator the *Answer Sheet* issued to you. You are allowed to take with you the candidate's copy / second page of the Answer Sheet along with the **Test Booklet**, after completion of the examination, for your reference.
10. Sheets for rough work are appended in the Test Booklet at the end.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

SEAL

1. The kinetic energy of electron in hydrogen-like ion is :
- (A) KZe^2/r
 (B) $KZe^2/2r$
 (C) $-KZe/r$
 (D) $-KZe^2/r$
2. 2 g of a radioactive isotope after one day reduces to 0.25 g. Its half-life period is :
- (A) 3 h
 (B) 5 h
 (C) 8 h
 (D) 6 h
3. Given the statements :
- (i) In an irreversible work cycle the entropy of the system remains constant.
 (ii) The dissolution of CuSO_4 in water is a reversible process.
 (iii) Enthalpy is an extensive property.
 (iv) In a closed system the exchange of energy between the system and the surrounding is permitted.
- The correct statements are :
- (A) (i) and (ii)
 (B) (iii) and (iv)
 (C) (i) and (iii)
 (D) (ii) and (iv)
4. The variation of enthalpy of reaction with temperature is given by :
- (A) Arrhenius equation
 (B) Kirchhoff's equation
 (C) Hess' law
 (D) Clausius-Clapeyron equation
5. Maxwell relation is $(\partial S/\partial V)_T = (\partial P/\partial T)_V$. Hence, for one mole of ideal gas $(\partial S/\partial V)_T$ is equal to :
- (A) PT
 (B) S/P
 (C) T/P
 (D) P/T
6. Examine the statements given below :
- (i) As temperature approaches zero $C_p \rightarrow 0$ and $C_v \rightarrow 0$.
 (ii) Entropy of all solids equal to zero at 0°K .
 (iii) The absolute entropy of an element is always positive.
- The correct statements are :
- (A) (i) and (ii)
 (B) (ii) and (iii)
 (C) (i) and (iii)
 (D) Only (i)

7. Which of the following characteristics of adsorption is wrong ?
- (A) Adsorption on solids is reversible in nature
- (B) Both enthalpy and entropy of adsorption is negative
- (C) Adsorption is generally selective in nature
- (D) Adsorption in general increases with increase of temperature
8. Which of the graphs drawn in the following is a straight line, if K is the rate constant for reaction ?
- (A) k versus T
- (B) $1/k$ versus T
- (C) $\log k$ versus $1/T$
- (D) $\log k$ versus T
9. The equivalent conductance (\wedge) and molar conductance (\wedge_m) of potash alum are related as :
- (A) $\wedge = \wedge_m$
- (B) $\wedge = \wedge_m/2$
- (C) $\wedge = \wedge_m/6$
- (D) $\wedge = \wedge_m/8$
10. Zinc is coated over iron to prevent rusting of iron because :
- (A) Zinc is less reactive than iron
- (B) $E^\circ(\text{Zn}^{2+}, \text{Zn}) > E^\circ(\text{Fe}^{2+}, \text{Fe})$
- (C) $E^\circ(\text{Zn}^{2+}, \text{Zn}) = E^\circ(\text{Fe}^{2+}, \text{Fe})$
- (D) $E^\circ(\text{Zn}^{2+}, \text{Zn}) < E^\circ(\text{Fe}^{2+}, \text{Fe})$
11. The S and L values of ^{18}O atom respectively are :
- (A) 1 and 1
- (B) 1 and 0
- (C) 0 and 1
- (D) 0 and 0
12. X-ray diffraction does not give any structural information for :
- (A) Metallic solids
- (B) Ionic solids
- (C) Amorphous solids
- (D) Molecular solids
13. The high temperature limits of vibrational partition functions ($\theta = hv/k$):
- (A) $(T/\theta)e^{-(\theta/T)}$
- (B) $(T/\theta)e^{-(\theta/2T)}$
- (C) $e^{-(\theta/2T)}$
- (D) $e^{-(\theta/T)}$

14. The probability that a particle in a one dimensional box of length a is found to be between 0 and $a/2$.
- (A) 1.0
 (B) 0.75
 (C) 0.5
 (D) 0.25
15. At high pressure the fugacity coefficient of a real gas is greater than one, because :
- (A) Attractive term overweighs the repulsive term
 (B) Repulsive term overweighs the attractive term
 (C) Repulsive term is equals to the attractive term
 (D) The system is independent of both the attractive and repulsive term
16. Given the following two relations :
 (i) $x_1 d\mu_1 + x_2 d\mu_2 = 0$ and (ii) $x_1 dV_1 + x_2 dV_2 = 0$ for a binary liquid mixture at constant temperature and pressure, the true statement is that :
- (A) Both the relations are correct
 (B) Relation (i) is correct, but (ii) is not
 (C) Relation (ii) is correct, but (i) is not
 (D) Both the relations are incorrect
17. For the spin angular momentum ladder operator $S_{\pm} = S_x \pm iS_y$, the commutator (S_z, S_{\pm}) is :
- (A) $-\hbar S_{\pm}$
 (B) $-\hbar S_{\mp}$
 (C) $\hbar S_{\mp}$
 (D) $\hbar S_{\pm}$
18. The packing fraction for a simple cubic lattice is close to :
- (A) 0.94
 (B) 0.76
 (C) 0.52
 (D) 0.45
19. If the wave function of a particle in one dimensional box of length a is $\psi(x) = A \sin(n\pi x/a)$ then A equals to :
- (A) $(2/a)^{1/2}$
 (B) $(2/a)^{-1/2}$
 (C) $(a/2)^{1/2}$
 (D) $(a/2)^{-1/2}$

20. The simple ground state VB wave function for HCl is written as $\psi_H(1_s, 1)\psi_{Cl}(3p_z, 2) + B$ where B stands for:
- (A) $\psi_H(3p_z, 2)\psi_{Cl}(1_s, 1)$
 (B) $\psi_H(1_s, 2)\psi_{Cl}(3p_z, 1)$
 (C) $\psi_{Cl}(1_s, 2)\psi_H(3p_z, 1)$
 (D) $\psi_{Cl}(1_s, 1)\psi_H(3s, 2)$
21. Heat capacity of a species is independent of temperature if it is:
- (A) Tetratomic
 (B) Triatomic
 (C) Diatomic
 (D) Monoatomic
22. For a trial wave function $\psi = c_1\phi_1 + c_2\phi_2$ of a system the matrix elements for the Hamiltonian are $\langle \phi_1 | H | \phi_1 \rangle = -1$, $\langle \phi_2 | H | \phi_2 \rangle = 1$, $\langle \phi_1 | H | \phi_2 \rangle = 1 = \langle \phi_2 | H | \phi_1 \rangle$. Approximate ground state energy of the system from linear variation principle is:
- (A) -1.0
 (B) $+1.0$
 (C) $+2^{1/2}$
 (D) $-2^{1/2}$
23. The electric dipole allowed transition among the following is:
- (A) $^3S \rightarrow ^3D$
 (B) $^3S \rightarrow ^3P$
 (C) $^3S \rightarrow ^1D$
 (D) $^3S \rightarrow ^1F$
24. The correct ΔG for the cell reaction involving steps:
 $Zn(s) \rightarrow Zn^{2+}(aq) + 2e^-$ and $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ is:
- (A) $\Delta G^\circ - RT \ln(a_{Zn^{2+}}/a_{Cu^{2+}})$
 (B) $\Delta G^\circ + RT \ln(a_{Zn^{2+}}/a_{Cu(s)})$
 (C) $\Delta G^\circ + RT \ln(a_{Zn^{2+}}/a_{Cu^{2+}})$
 (D) $\Delta G^\circ - RT \ln(a_{Zn(s)}/a_{Cu^{2+}})$
25. If the concept of **half-life** is generalized to **quarter-life** of a first order chemical reaction, it will be equal to:
- (A) $\ln 2/k$
 (B) $\ln 4/k$
 (C) $4/k$
 (D) $14/k$

26. Identify, from the following the correct ionic strength, for (a) 0.01 molal solution of NaCl and (b) a 0.01 molal solution of Na_2SO_4 :

(A) (a) .010 mol kg^{-1} (b) 0.010 mol kg^{-1}

(B) (a) .010 mol kg^{-1} (b) 0.030 mol kg^{-1}

(C) (a) .010 mol kg^{-1} (b) 0.025 mol kg^{-1}

(D) (a) .010 mol kg^{-1} (b) 0.015 mol kg^{-1}

27. The inter planar distance (in unit of Å) for (1 0 0) plane in a cubic structure with the lattice parameter of 4 Å is :

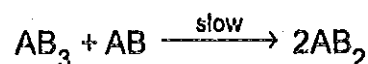
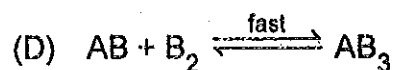
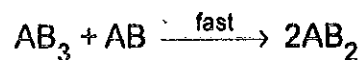
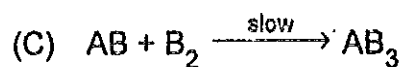
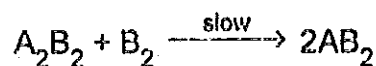
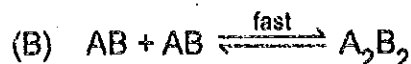
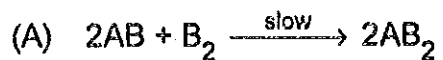
(A) 1

(B) 2

(C) 4

(D) 8

28. The rate equation for the reaction, $2\text{AB} + \text{B}_2 \rightarrow 2\text{AB}_2$ is given by Rate = k [AB] [B₂]. A possible mechanism consistent with this rate law is :



29. Which is the correct Nernst equation for redox reaction $\text{O} + n\text{e} \leftrightarrow \text{R}$:

(A) $[\text{O}]/[\text{R}] = \exp \{ (nF/RT)(E - E^0) \}$

(B) $[\text{O}]/[\text{R}] = \exp \{ (-nF/RT)(E - E^0) \}$

(C) $[\text{R}]/[\text{O}] = \exp \{ (nF/RT)(E - E^0) \}$

(D) $E = E^0 - \{ (RT/nF) \ln([\text{O}]/[\text{R}]) \}$

30. Work (w) involved in isothermal reversible expansion from V_i to V_f for n moles of an ideal gas is :

- (A) $w = -nRT \ln(V_f/V_i)$
- (B) $w = nRT (V_f/V_i)$
- (C) $w = -nRT (V_f/V_i)$
- (D) $w = nRT \ln(V_f/V_i)$

31. A plane of spacing d shows first order Bragg diffraction at angle θ . A plane of spacing $2d$ show Bragg diffraction at :

- (A) 2θ
- (B) $\theta/2$
- (C) $\sin^{-1}(\sin\theta/2)$
- (D) $\sin^{-1}(\sin 2\theta/2)$

32. The angular momentum operator L_z is :

- (A) $\frac{ih}{2\pi} \left[x \frac{\partial}{\partial y} - y \frac{\partial}{\partial x} \right]$
- (B) $\frac{ih}{2\pi} \left[y \frac{\partial}{\partial z} - z \frac{\partial}{\partial y} \right]$
- (C) $\frac{h}{2i\pi} \left[z \frac{\partial}{\partial x} - x \frac{\partial}{\partial z} \right]$
- (D) $-\frac{ih}{2\pi m} \frac{\partial}{\partial y}$

33. The most probable value of r for an electron in $1s$ orbital of hydrogen atom is :

- (A) $a_0/2$
- (B) a_0
- (C) $2^{1/2} a_0$
- (D) $3a_0/2$

34. Given the statements :

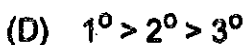
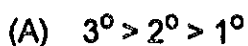
- (i) An asymmetric molecule does not have any symmetry elements.
- (ii) A dissymmetric molecule may have some symmetry element.
- (iii) The necessary and sufficient condition of optical activity is non-superimposition of mirror images.
- (iv) Tris-chelate metal complexes are optically active.

The correct answer(s) is / are following :

- (A) Only (i)
- (B) Only (i) and (iii)
- (C) Only (i), (ii) and (iii)
- (D) All of the above

35. The order of stability of carbocations

is :



36. Which of the following represents the

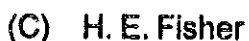
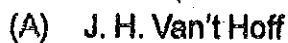
correct relative bond polarities ?



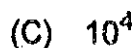
37. The first person to separate a

racemic mixture into individual

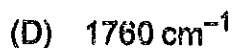
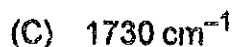
enantiomers :



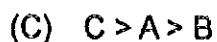
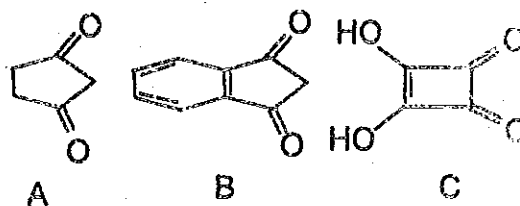
38. The average end-to-end distance of a random coil polymer of 10^6 monomers (in units of segment length) is :



39. In the IR spectrum p-nitro phenyl acetate, the carbonyl absorption band appears at :

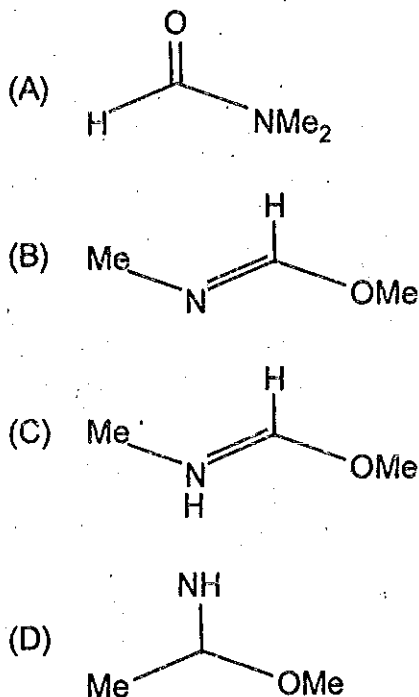


40. The correct order of acidity of the compounds A, B and C is :

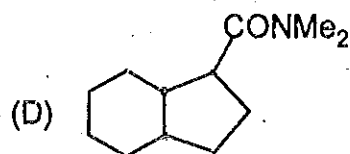
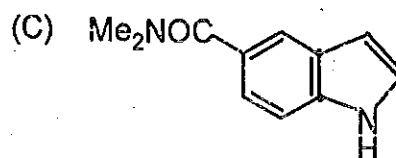
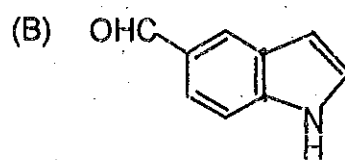
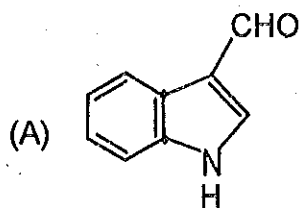
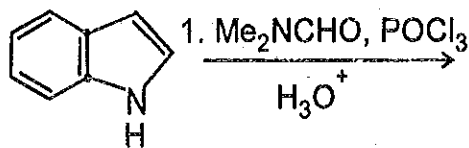


41. In the $^1\text{H-NMR}$ spectrum recorded at 293 K, an organic compound ($\text{C}_3\text{H}_7\text{NO}$) exhibited signals at δ 7.8 (1H, s), 2.8 (3H, s) and 2.6(3H, s).

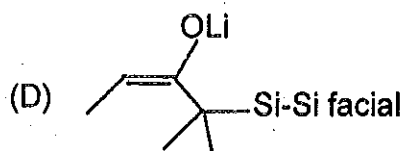
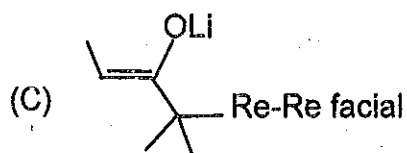
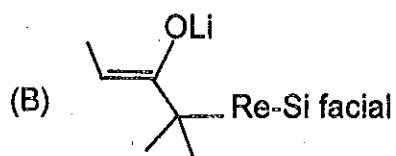
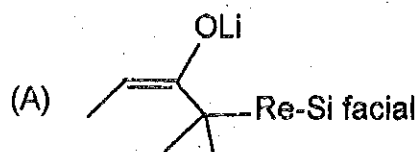
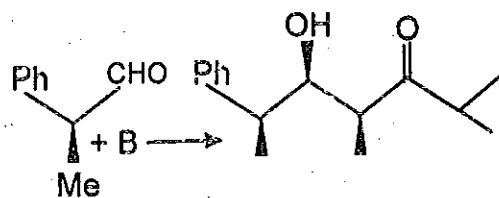
The compound is :



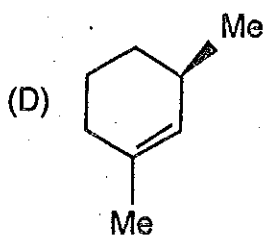
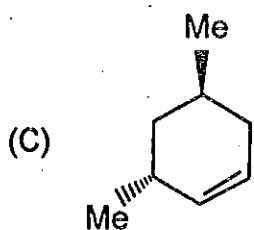
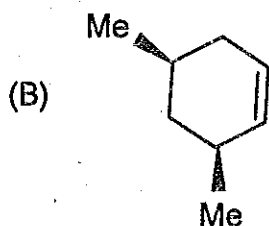
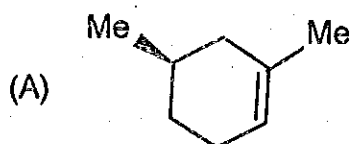
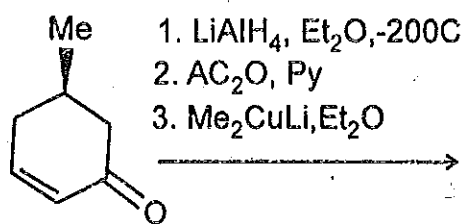
42. The major product formed in the following reaction is :



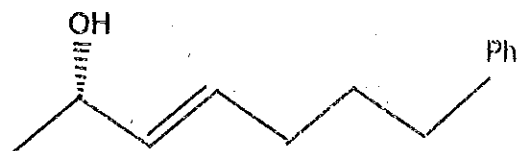
43. In the following reaction, structure of B and the mode of addition are :



44. The major product formed in the following reaction sequence is :

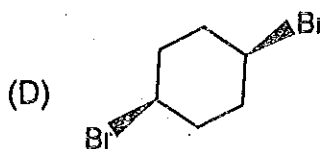
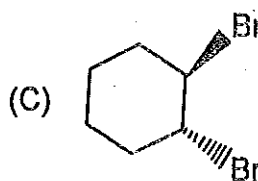
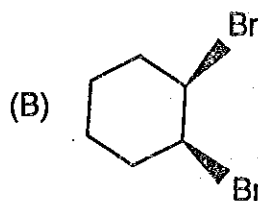
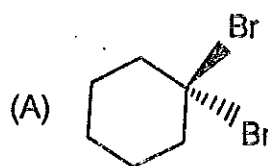


45. The IUPAC name for the compound given below is :

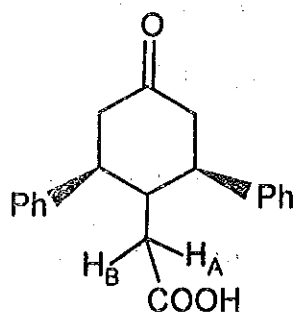


- (A) (2R, 3Z)-7-phenylhept-3-en-2-ol
 (B) (2S, 3Z)-7-phenylhept-3-en-2-ol
 (C) (2R, 3E)-7-phenylhept-3-en-2-ol
 (D) (2S, 3E)-7-phenylhept-3-en-2-ol

46. Among the following dibromocyclohexanes the one that react fastest with NaI to give cyclohexene is :

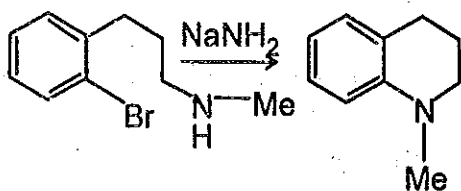


47. In the compound given below, the hydrogen marked A and B are :



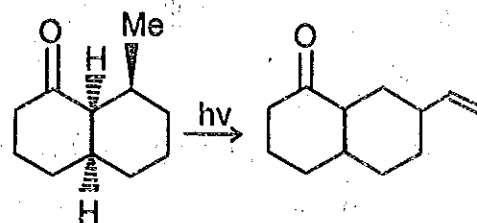
- (A) Homotopic
- (B) Isotopic
- (C) Enantiotopic
- (D) Diastereotopic

48. The reactive intermediate involved in the following reaction is :



- (A) A free radical
- (B) A carbocation
- (C) A quinone
- (D) An arvne

49. The following photochemical conversion proceeds through :

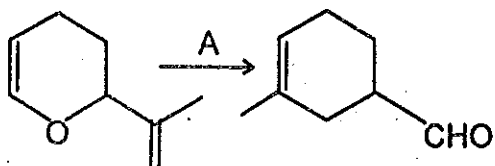


- (A) Barton reaction
- (B) Paterno-Buchi reaction
- (C) Norrish type I reaction
- (D) Norrish type II reaction

50. The major product formed in the reaction of styrene with an excess of lithium in Liquid ammonia and t-butylalcohol is :

- (A)
- (B)
- (C)
- (D)

51. The following reaction proceeds through a :

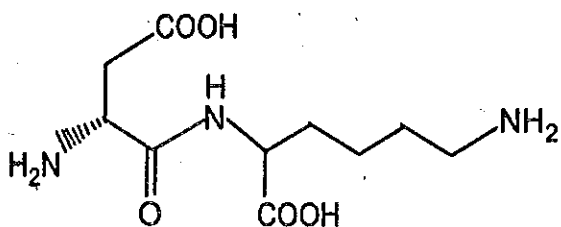


- (A) 1,3-sigmatropic rearrangement
 (B) 2,3-sigmatropic rearrangement
 (C) 3,3-sigmatropic rearrangement
 (D) 3,5-sigmatropic rearrangement

52. The number of nodes present in the highest occupied molecular orbital of 1,3,5-hexatriene in the ground state is :

- (A) One
 (B) Two
 (C) Three
 (D) Four

53. The constituent amino acids present in the following dipeptide, respectively, are :



- (A) (R)-aspartic acid and (S)-lysine

(B) (S)-aspartic acid and (R)-lysine

(C) (R)-glutamic acid and (S)-arginine

(D) (S)-glutamic acid and (S)-arginine

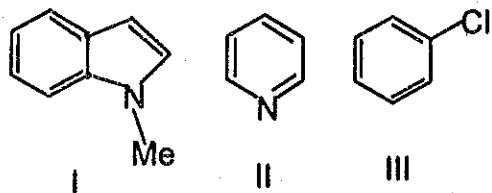
54. L-DOPA is used for the treatment of :

- (A) Tuberculosis
 (B) Parkinson's disease
 (C) Diabetes
 (D) Cancer

55. The number of π electrons participating and pericyclic mode in the following reaction are :

- (A) 4 and conrotatory
 (B) 4 and disrotatory
 (C) 6 and conrotatory
 (D) 6 and disrotatory

56. The correct order for the rates of electrophilic aromatic substitution of the following compound is :



- (A) I > II > III
 (B) II > I > III
 (C) III > II > I
 (D) I > III > II

57. Consider the following statements about **cis-** and **trans-**decalins :

- (1) **cis-**isomer is more stable than **trans-**isomer
 (2) **trans-**isomer is more stable than **cis-**isomer
 (3) **trans-**isomer undergoes ring flip
 (4) **cis-**isomer undergoes ring flip

The correct statements among the above are :

- (A) (2) and (4)

- (B) (1) and (3)
 (C) (1) and (4)
 (D) (2) and (3)

58. The correct order of the size of S, S²⁻, S²⁺ and S⁴⁺ species is :

- (A) S > S²⁺ > S⁴⁺ > S²⁻
 (B) S > S²⁺ > S⁴⁺ > S²⁻
 (C) S²⁻ > S > S²⁺ > S⁴⁺
 (D) S⁴⁺ > S²⁻ > S > S²⁺

59. The five d-orbitals of a metal have proper symmetry to form the following bonds, when bonded to a similar atom :

- (A) One σ -bond, two π -bonds and two δ -bonds
 (B) Two σ -bonds, two π -bonds and one δ -bond
 (C) Two σ -bonds, one π -bond and two δ -bonds
 (D) One σ -bond, three π -bonds and one δ -bond

60. The CO stretching frequencies of complexes :

- (i) fac-[Mo(CO)₃(PF₃)₃]
- (ii) fac-[Mo(CO)₃(PCl₃)₃]
- (iii) fac-[Mo(CO)₃(PClPh₂)₃]
- (iv) fac-[Mo(CO)₃(PMe₃)₃]

are in order :

- (A) (i) < (ii) < (iii) < (iv)
- (B) (i) > (ii) > (iii) > (iv)
- (C) (i) < (ii) > (iii) < (iv)
- (D) (i) < (ii) < (iii) > (iv)

61. Structures of a carborane with formula C₂B₄H₈ is formally derived from :

- (A) **Close-borane**
- (B) **Nido-borane**
- (C) **Arachno-borane**
- (D) **Conjuncto-borane**

62. In the cluster [CO₃(CH)(CO)₉] obeying 18 electron rule, the number of metal-metal bonds and bridging ligands respectively are :

- (A) 3 and 1 CH
- (B) 0 and 3 CO

(C) 3 and 1 CO

(D) 6 and 1 CH

63. The correct spinel structure of CO₃O₄ is :

- (A) (Co³⁺ Co²⁺)_t (Co³⁺)_o O₄
- (B) (Co³⁺)_t (Co²⁺ Co³⁺)_o O₄
- (C) (Co²⁺)_t (2Co³⁺)_o O₄
- (D) (2Co³⁺)_t (Co²⁺)_o O₄

64. In the molecular orbital energy level diagram of CO, HOMO and LUMO, respectively are :

- (A) σ and π
- (B) π and σ
- (C) σ and σ
- (D) π and π

65. The number of spin allowed transitions in octahedral high spin complexes of d³, d⁴ and d⁵ systems, respectively are :

- (A) 2, 3 and 1
- (B) 3, 1 and 0.
- (C) 0, 1 and 2
- (D) 2, 3 and 0

66. The number of stereoisomers of $\text{trans-}[\text{CoCl}_2(\text{en})_2]^+$ is :

- (A) One
- (B) Two
- (C) Three
- (D) Four

67. The compound that will behave as an acid in H_2SO_4 is :

- (A) CH_3COOH
- (B) HNO_3
- (C) $\text{C}_2\text{H}_5\text{OH}$
- (D) HClO_4

68. Among the oxides of nitrogen, N_2O_3 , N_2O_4 and N_2O_5 the compound(s) having N-N bond is/are :

- (A) N_2O_3 and N_2O_5
- (B) N_2O_3 and N_2O_4
- (C) N_2O_4 and N_2O_5
- (D) N_2O_5 only

69. The increasing order of π -acidity of the ligands C_2F_4 , NEt_3 , CO and C_2H_4 is :

- (A) $\text{CO} < \text{C}_2\text{F}_4 < \text{C}_2\text{H}_4 < \text{NEt}_3$
- (B) $\text{C}_2\text{F}_4 < \text{C}_2\text{H}_4 < \text{NEt}_3 < \text{CO}$
- (C) $\text{C}_2\text{H}_4 < \text{NEt}_3 < \text{C}_2\text{F}_4 < \text{CO}$
- (D) $\text{NEt}_3 < \text{C}_2\text{H}_4 < \text{C}_2\text{F}_4 < \text{CO}$

70. The species with highest spin only magnetic moment values is :

- (A) $[\text{Co}(\text{NO}_2)_6]^{3-}$
- (B) VCl_6^{4-}
- (C) $[\text{FeBr}_6]^{3-}$
- (D) $[\text{Ni}(\text{EDTA})]^{2-}$

71. Three bands in electronic spectrum of $[\text{Cr}(\text{NH}_3)_6]^{3+}$ are the following :

- (i) ${}^4\text{A}_{2g} \rightarrow {}^4\text{T}_{1g}$
- (ii) ${}^4\text{A}_{2g} \rightarrow {}^4\text{T}_{2g}$
- (iii) ${}^4\text{A}_{2g} \rightarrow {}^2\text{E}_g$

Identify the correct statement about them :

- (A) Intensity of 1 is lowest
- (B) Intensity of 3 is lowest
- (C) Intensity of 1 and 3 are similar
- (D) Intensity of all are similar

72. The total quantum number J is a good quantum number for :

- (A) s-block elements
- (B) p-block elements
- (C) d-block elements
- (D) f-block elements

73. $H_2C = C = CH_2$ belongs to the point group :

- (A) $D_{\infty h}$
- (B) D_{2d}
- (C) C_{2v}
- (D) D_{2h}

74. Given below the statements :

- (1) Conjugate elements belong to same class.
- (2) Character of matrices for conjugate elements are identical.
- (3) A conjugate element of a point group can be replaced by another conjugate element on applying an appropriate symmetry operator.

(4) If a is conjugate to b then b is also conjugate to a .

The correct statements are :

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

75. In any finite point group

Dimensionality of a representation :

- (1) Equals the dimensionality of the matrices instituting the representation.
- (2) Equals the character under identity.
- (3) Equals the number of basis functions used to find the representation.

The correct statements are :

- (A) All
- (B) Only (1) and (2)
- (C) Only (1) and (3)
- (D) Only (2) and (3)

76. The point groups for the compounds $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$ and $\text{cis-}[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$ is :

- (A) C_{5v} and C_{2h}
- (B) C_{2v} and C_{4v}
- (C) C_{4v} and C_{2v}
- (D) C_{4v} and C_{2h}

77. The crystal field strengths of ligands CO, NH_3 and Cl follow the order :

- (A) $\text{CO} > \text{Cl} > \text{NH}_3$
- (B) $\text{NH}_3 > \text{CO} > \text{Cl}$
- (C) $\text{CO} < \text{NH}_3 < \text{Cl}$
- (D) $\text{CO} > \text{NH}_3 > \text{Cl}$

78. The crystal field ground terms for a d^2 octahedral complex is :

- (A) ${}^3A_{2g}$
- (B) ${}^3T_{2g}$
- (C) ${}^3T_{1g}$
- (D) ${}^1T_{2g}$

79. Mulliken symbol for the irreducible representation Γ for the following point group is :

$$E \quad C_n \quad nC_2 \quad i \quad - \quad -$$

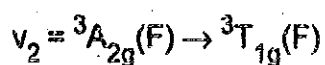
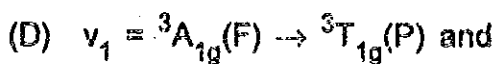
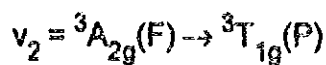
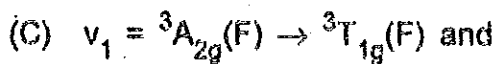
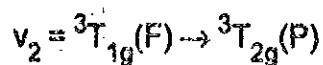
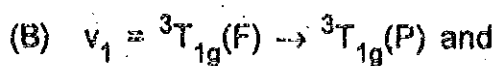
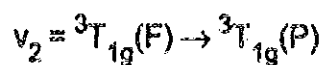
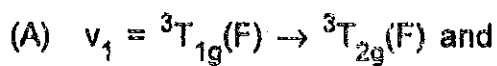
$$\Gamma \quad 1 \quad -1 \quad -1 \quad 1 \quad - \quad -$$

- (A) A_{1g}
- (B) A_{2u}
- (C) B_{1u}
- (D) B_{2g}

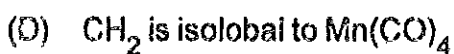
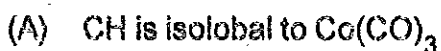
80. The compounds (1) $\text{K}_2\text{Ba}[\text{Cu}(\text{NO}_2)_6]$ and (2) $\text{Cs}_2\text{Ba}[\text{Cu}(\text{NO}_2)_6]$ exhibit tetragonal elongation and tetragonal compression respectively. The unpaired electrons in 1 and 2 are found, respectively in orbitals :

- (A) d_z^2 and $d_{x^2-x^2}$
- (B) $d_{x^2-x^2}$ and d_z^2
- (C) d_z^2 and d_z^2
- (D) $d_{x^2-x^2}$ and $d_{x^2-x^2}$

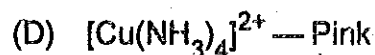
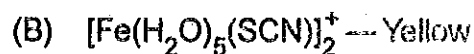
81. Electronic spectrum of $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ exhibits two absorption bands $\nu_1(17,800\text{cm}^{-1})$ and $\nu_2(25,700\text{cm}^{-1})$. The correct assignments of the bands, respectively, is :



82. Among the following the correct statement is :



83. Among the following the correct combination of complex and its color is :



84. In B_5H_9 the number of 3c-2e 'BBB' bond(s) present is/are :

(A) Zero

(B) One

(C) Two

(D) Three

85. In bis-(dimethylglyoximate)nickel(II) the number of Ni-N, Ni-O and intramolecular hydrogen bonds, respectively are :

(A) 4, 0 and 2

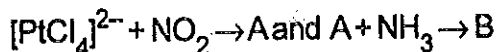
(B) 2, 2 and 2

(C) 2, 2 and 0

(D) 4, 0 and 1

86. The initial product of fusion of chromite with sodium carbonate is :
- (A) Na_2CrO_4 and Fe_2O_3
 (B) $\text{Na}_2\text{Cr}_2\text{O}_7$ and Fe_2O_3
 (C) $\text{Cr}_2(\text{CO}_3)_3$ and $\text{Fe}(\text{OH})_3$
 (D) Na_2CrO_4 and $\text{Fe}(\text{OH})_3$
87. Among F^- , Na^+ , O^{2-} and Mg^{2-} ions those having the highest and lowest ionic radii respectively are :
- (A) Na^+ and F^-
 (B) O^{2-} and Mg^{2-}
 (C) O^{2-} and Na^+
 (D) F^- and Mg^{2-}
88. The spin-only magnetic moment and the Russel-Saunders ground state for $[\text{FeCl}_6]^{4-}$ ion respectively :
- (A) 4.9 BM and ^5D
 (B) 4.9 BM and ^3D
 (C) 4.9 BM and ^3F
 (D) 4.9 BM and ^4F
89. Among the complexes :
- (1) $[\text{Co}(\text{en})_3]^{3+}$
 (2) $\text{Trans-CoCl}_2(\text{en})_2^+$
 (3) $[\text{Cr}(\text{EDTA})]^-$
- the chiral one(s) is/are :
- (A) (1) and (2)
 (B) (2) and (3)
 (C) (1) and (3)
 (D) All of these
90. The compound that undergoes oxidative addition reaction in presence of H_2 is :
- (A) $[\text{Mn}(\text{CO})_5]^-$
 (B) $[\eta^5\text{-C}_5\text{H}_5]\text{Mo}(\text{CO})_3^-$
 (C) $[\text{IrCl}(\text{CO})(\text{PPh}_3)_2]$
 (D) $[\eta^5\text{-C}_5\text{H}_5)_2\text{ReH}]$
91. The resonance Raman stretching frequency of O_2 is 1580 cm^{-1} . The same for O_2 bound to oxy-hemoglobin is close to :
- (A) 1600 cm^{-1}
 (B) 1900 cm^{-1}
 (C) 800 cm^{-1}
 (D) 1100 cm^{-1}

92. In the following reaction :



Then the compound B is :

- (A) $\text{trans-}[\text{PtCl}_2(\text{NH}_3)_2]$
- (B) $\text{cis-}[\text{PtCl}_2(\text{NO}_2)_2]^{2-}$
- (C) $\text{trans-}[\text{PtCl}_2(\text{NO}_2)(\text{NH}_3)]^-$
- (D) $\text{cis-}[\text{PtCl}_2(\text{NO}_2)(\text{NH}_3)]^-$

93. Among the following those can act as Mossbauer nuclei are :

- (1) ^{129}I
- (2) ^{57}Co
- (3) ^{57}Fe

- (A) (1) and (2)
- (B) (1) and (3)
- (C) (2) and (3)
- (D) All of these

94. Which of the following will result in deviation from Beer's law ?

- (1) Change in refractive index or medium
- (2) Dissociation analyte on dilution
- (3) Polychromatic light
- (4) Path length of cuvette

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

95. EPR spectrum of a free radical containing nuclei with nonzero nuclear spin is obtained. If the following selection rules are observed :

- (A) $\Delta m_s = 0, \Delta m_l = 0$
- (B) $\Delta m_s = \pm 1, \Delta m_l = 0$
- (C) $\Delta m_s = \pm 1, \Delta m_l = \pm 1$
- (D) $\Delta m_s = 0, \Delta m_l = \pm 1$

96. Consider the following parameters with reference to the fluorescence of a solution :

- (1) Molar absorptivity of fluorescent molecules
- (2) Intensity of light source used for excitation
- (3) Dissolved oxygen

The correct answer for the enhancement of fluorescence with the increase in these parameters is/are :

- (A) (1) and (2)
- (B) (2) and (3)
- (C) (1) and (3)
- (D) (3) only

97. Given $\nu(^1\text{H}) \approx 2.7 \times 10^8 \text{T}^1 \text{S}^{-1}$. The resonance frequency of proton in magnetic field of 12.6T is close to :
- (A) 60 MHz
(B) 110 MHz
(C) 540 MHz
(D) 780 MHz
98. The spectroscopic technique that can distinguish unambiguously between *trans*-1,2-dichloroethylene and *cis*-1,2-dichloroethylene without any numerical calculation is :
- (A) Microwave spectroscopy
(B) UV-Visible spectroscopy
(C) X-ray photoelectron spectroscopy
(D) γ -ray spectroscopy
99. Number of signals in the $^{13}\text{C}\{^1\text{H}\}$ NMR spectrum of (R)-4-methylpentan-2-ol are :
- (A) 3
(B) 4
(C) 5
(D) 6
100. The irreducible representation (IR)s of C_{2h} point group are A_g, B_g, A_u and B_u . The Raman active modes of *trans*-1,3-butadiene belongs to the IRs :
- (A) A_g and A_u
(B) B_g and B_u
(C) A_g and B_g
(D) A_u and B_u

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SEAL