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OPSC
PGT
Previous Year Paper
(Chemistry)
30 Apr, 2023

Test Booklet Series

A

TEST BOOKLET

PAPER – II

CHEMISTRY

T. B. C. : PGT – 3/21

30029

SI. No.

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 (answers) 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

1. The point group symmetry of BrF_5 is :

   (A) C_{2v}

   (B) D_{2h}

   (C) D_{4h}

   (D) C_{4v}

2. Which is the incorrect irreducible representation in the following character table of D_4 ?

	E	C_2	$2C_4$	$2C_2'$	$2C_2'$
(A)	1	1	1	-1	-1
(B)	1	1	-1	1	-1
(C)	1	1	-1	-1	1
(D)	1	-1	1	-1	1

3. The correct relation involving symmetry operations :

   (A) $S_4^2 = S_2$

   (B) $\sigma(xz)\,\sigma(yz) = C_2(x)$

   (C) $S_4^3 = C_4^3$

   (D) $S_6^3 = S_2$

4. Compare the relative stability of the following species $O_2, O_2^+, O_2^-, O_2^{2-}$:

   (A) $O_2 > O_2^+ > O_2^- > O_2^{2-}$

   (B) $O_2 < O_2^+ < O_2^- < O_2^{2-}$

   (C) $O_2^+ > O_2 > O_2^- > O_2^{2-}$

   (D) $O_2^+ < O_2 < O_2^- < O_2^{2-}$

5. The formation of molecular orbitals from atomic orbitals causes electron density to be :

   (A) Zero in the nodal plane

   (B) Zero in the surface of the lobe

   (C) Minimum in the nodal plane

   (D) Maximum in the nodal plane

6. The correct combination for π and π^* orbitals in B_2 molecule is :

	Π	π^*
(A)	Gerade	Ungerade
(B)	Ungerade	Gerade
(C)	Gerade	Gerade
(D)	Ungerade	Ungerade

7. The correct shape of $[TeF_5]^-$ ion based on VSEPR theory is :

   (A) Trigonal bipyramidal

   (B) Square pyramidal

   (C) Pentagonal planar

   (D) See-saw

8. The reaction of IO_3^- with I^- in an aqueous acidic medium results in :

(A) I_2 and H_2O

(B) I_2 and H_2O_2

(C) IO^- and H_2O

(D) IO^- and H_2O_2

9. The number of times the A_1 representation appears in the representation Γ of the C_{2v} point group given below is :

C_{2v}	E	C_2	σ_v	σ_v'
Γ	3	1	1	3

(A) 1

(B) 2

(C) 3

(D) 4

10. Geometries of SNF_3 and XeF_2O_2, respectively, are :

(A) Square planar and square planar

(B) Square planar and trigonal bipyramidal

(C) Tetrahedral and trigonal bipyramidal

(D) Tetrahedral and tetrahedral

11. Consider compounds PF_5, SbF_5, PH_3 and SbH_3. The strongest acid and the strongest base among these are, respectively :

(A) PF_5 and PH_3

(B) SbF_5 and PH_3

(C) SbF_5 and SbH_3

(D) PF_5 and SbH_3

12. The characters of LUMO of CN^- and O_2 respectively, are :

(A) σ_g and π_u

(B) π_u and σ_u

(C) π_g and σ_u

(D) σ_u and π_g

13. Among ClO_3^-, XeO_3 and SO_3, species with pyramidal shape is / are :

(A) ClO_3^- and XeO_3

(B) XeO_3 and SO_3

(C) ClO_3^- and SO_3

(D) SO_3

14. In compounds of type ECl_3, where E = B, P, As, or Bi, the angle Cl – E – Cl :

(A) A > P = As > B

(B) B > P > As > B

(C) B < P = As = B

(D) B < P < As < P

15. The hybridization of atomic orbitals of nitrogen in NO_2^+, NO_3^-, and NH_4^+ are :

(A) sp, sp^3 and sp^2 respectively

(B) sp, sp^2 and sp^3 respectively

(C) sp^2, sp and sp^3 respectively

(D) sp^2, sp^3 and sp respectively

16. The correct increasing order of C-C bond length in the following molecules (A-C) $[PtCl_3(C_2H_4)]^-$ (a), $[Pt(PPh_3)_2(C_2H_4)]$ (b), $[Pt(PPh_3)_2\{C_2(CN)_4\}]$ (c), is :

(A) (c) < (a) < (b)

(B) (a) < (b) < (c)

(C) (b) < (c) < (a)

(D) (c) < (b) < (a)

17. The correct statement for cytochrome c is :

(A) It is a non-heme protein

(B) The coordination number of iron in cytochrome c is five

(C) It is a redox protein and an electron carrier

(D) It can store or carry dioxygen

18. The number of bridging ligand(s) and metal-metal bond(s) present in the complex $[Ru_2(\eta5 – C_p)_2 (Co)_2 (Ph_2PCH_2PPh_2)]$ obeys 18-electron rule, respectively are :

(A) 0 and 1

(B) 2 and 1

(C) 3 and 1

(D) 1 and 2

19. The rate of alkene coordination to $[PtCl_4]^{2-}$ is highest for :

(A) Norbornene

(B) Ethylene

(C) Cyclohexene

(D) 1-butene

20. The number of inorganic sulphur (or sulphide) atoms present in the metalloprotein active sites of rubredoxin, 2-iron ferredoxin, and 4-iron ferredoxin, respectively are :

(A) 0, 2 and 4

(B) 2, 4 and 3

(C) 0, 4 and 2

(D) 0, 2 and 3

21. For OH-catalyzed S_N^1 conjugate base mechanism of $[Co(NH_3)_5Cl]^{2+}$, the species obtained in the first step of the reaction is / are :

(A) $[Co(NH_3)_5(OH)]^{2+} + Cl^-$

(B) $[Co(NH_3)_4(NH_2)]^{2+} + H_2O$

(C) $[Co(NH_3)_4(NH_2)]^{2+} + Cl^-$

(D) $[Co(NH_3)_5Cl(OH)]^+$ only

22. The correct order of C–O bond length is :

(A) $H_2B \cdot CO$ > $[Mn(CO)_6]^+$ > $[Cr(CO)_6]$ > $[V(CO)_6]^-$

(B) $[V(CO)_6]^-$ > $[Cr(CO)_6]$ > $[Mn(CO)_6]^+$ > $H_3B \cdot CO$

(C) $[Mn(CO)_6]^+$ > $H_3B \cdot CO$ > $[V(CO)_6]^-$ > $[Cr(CO)_6]$

(D) $[Cr(CO)_6]$ > $[V(CO)_6]^-$ > $H_3B \cdot CO$ > $[Mn(CO)_6]^+$

23. The intermediate $[Fe(SCN)(H_2O_5)]^{2+}$ is detected in the reaction of $[Co(NCS)(NH_3)_5]^{2+}$ with $[Fe(H_2O)_6]^{2+}$ in aqueous medium to produce $[Co(H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{3+}$. The mechanism of the reaction is :

(A) Interchange dissociative

(B) Interchange associative

(C) Inner sphere electron transfer

(D) Outer sphere electron transfer

24. The correct order of acceptor ability of the phosphorus ligands is :

(A) PMe_3 > PPh_3 > $P(OPh)_3$ > PF_3

(B) PF_3 > $P(OPh)_3$ > PPh_3 > PMe_3

(C) PF_3 > PMe_3 > PPh_3 > $P(OPh)_3$

(D) $P(OPh)_3$ > PF_3 > PMe_3 > PPh_3

25. The number of Ni-Ni bonds in $[CpNi(\mu - PPh_2)]_2$ complexes obeying the 18 electron rule is :

(A) 0

(B) 1

(C) 2

(D) 3

26. For the reaction of trans-$[IrX(CO)(PPh_3)_2]$ (X = F, Cl, Br, I) with O_2, the correct order of variation of rate with X is :

(A) Br > I F > Cl

(B) F > Cl > Br > I

(C) F ≈ Cl ≈ Br ≈ I

(D) I > Br > Cl > F

27. Donor mode of NO ligand depends on the metal. Now consider the following complexes (in a gaseous state) :

(i) $[IrCl(CO)(PPh_3)_2(NO)]^+$

(ii) $[RuCl(PPh_3)_2(NO)]^+$

(iii) $[CO(NCS)(diars)_2(NO)]^+$

where diars = $0 - (Me_2AS)_2$

C_6H_4

(iv) $[Cr(CN)_5(NO)]^{3+}$
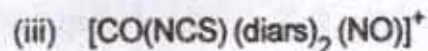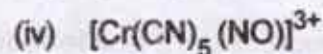
The complexes that do not exhibit bent NO coordination mode is / are :

(A) (i) and (ii)

(B) (iii) and (iv)

(C) (iv) only

(D) (ii) only

28. From the following transformations :

(i) Epoxidation of alkene

(ii) Diol dehydrase reaction

(iii) Conversion of ribo-nucleotide to a deoxyribo-nucleotide
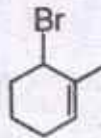
(iv) 1, 2-carbon shift in organic substrates

Those promote by coenzyme B_{12} are :
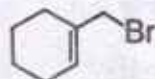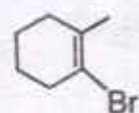
(A) (i) and (ii)

(B) (ii), (iii) and (iv)

(C) (i), (ii) and (iv)

(D) (i), (ii) and (iii)

29. The electronic absorption spectrum of an aqueous solution of $[Ni(en)_3]^{2+}$ exhibits broad absorption with λ_{max} = 325, 550 and 900 nm. The visible region band absorb in :

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

(B) $^3A_{2g} \rightarrow {}^3T_{1g}(P)$

(C) $^3A_{2g} \rightarrow {}^3T_{1g}(F)$

(D) None of these

30. Among XeO_3, F_2, ICl_2^-, ClO^- and SO_3^{2-} the number of species having three lone pair of electrons on the central atom according to VSEPR theory is :

(A) 3

(B) 0

(C) 4

(D) 2

31. Which one of the following pairs of electronic configurations of low spin transition metal ions (3d) in an octahedral field undergoes a strong John Teller Distortion ?

(A) d^1, d^9

(B) d^7, d^9

(C) d^6, d^2

(D) d^4, d^3

32. The term symbol for the ground state of rhodium (Rh, atomic number 45) is ^4F. The electronic configuration for this term symbol is :

(A) $[Kr] 4d^7 5s^2$

(B) $[Kr] 4d^8 5s^1$

(C) $[Kr] 4d^9 5s^0$

(D) $[Kr] 4d^7 5s^1 5p^1$

33. $[Ni(NH_3)_6]^{2+}$ exhibits three absorption bands at 10750, 17500 and 28200 cm^{-1}. The values of Δ_0 and B' for $[Ni(NH_3)_6]^{2+}$ are respectively :

(A) 9000 cm^{-1} and 900 cm^{-1}

(B) 10750 cm^{-1} and 900 cm^{-1}

(C) 10700 cm^{-1} and 900 cm^{-1}

(D) 6800 cm^{-1} and 900 cm^{-1}

34. The actual magnetic moment shows a large deviation from the spin-only formula in the case of :

(A) Ti^{3+}

(B) V^{3+}

(C) Gd^{3+}

(D) Sm^{3+}

35. The set of allowed electronic transition among the following is :

    (i) $^4\Sigma \to {}^2\Pi$

    (ii) $^3\Sigma \to {}^3\Pi$

    (iii) $^1\Delta \to {}^1\Delta$

    (iv) $^2\Pi \to {}^2\Pi$

    (v) $^3\Sigma \to {}^3\Delta$
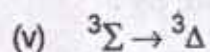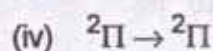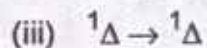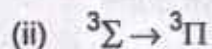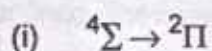
    (A) (i), (ii) and (v)

    (B) (i), (iii) and (v)

    (C) (ii), (iii) and (iv)

    (D) (iii), (iv) and (v)

36. Identify the correct statement(s) :

    (i)   Ground state term for Ni^{2+} ion is ^3F

    (ii) The highest energy orbital in trigonal bipyramidal complex is d_{z^2}.

    (iii) In $MnCr_2O_4$, Mn^{2+} will have CFSE in octahedral site whereas Cr^{3+} will not

    (iv) $CoCl_4^{2+}$ shows spin allowed and Laporte partially allowed transition.

    (A) (i) and (ii)

    (B) (i) and (iii)

    (C) (i), (ii) and (iv)

    (D) All of these

37. Choose the correct statements about Tanabe-Sugano diagrams :

    (i) E/B is plotted against Δ_O/B.

    (ii) The zero energy is taken as that of the lowest term.

    (iii) Terms of the same symmetry cross each other.

    (iv) Two terms of the same symmetry upon increases of ligand field strength bend apart from each other.

    Correct answer is :

    (A) (i) and (ii)

    (B) (i) and (iii)

    (C) (i), (ii) and (iv)

    (D) (i), (ii), (iii) and (iv)
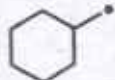
38. Which of the following is the most unlikely product of bromination of 1-methyl cyclohexene with NBS and initiation by photolysis of a peroxide ?

(A)

(B)

(C)

(D)

39. Which radical is not involved in the following reaction ?
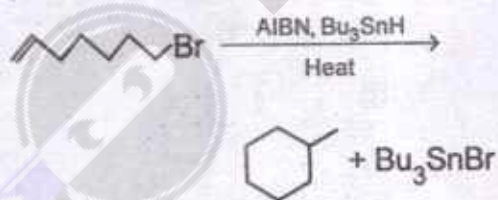
(A)

(B) $Bu_3Sn^{\bullet}$

(C)

(D)

40. Which is the correct assignment of chirality at C_2 and C_3 of the following molecule ?
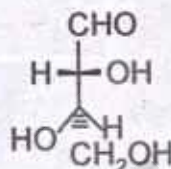
(A) R, R

(B) S, S

(C) R, S

(D) S, R

41. Which of the following statements regarding the S_N2 mechanism is wrong ?

(A) It is a one-step reaction.

(B) It is a bimolecular reaction.

(C) It always involves inversion of configuration.

(D) It involves only one transition state.

42. Which is the most reactive compound by the S_N1 mechanism?

(A)

(B)

(C)

(D)
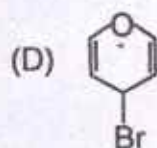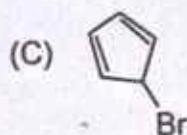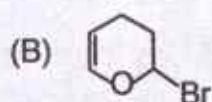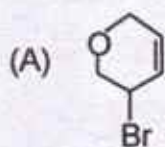
43. Which compound is the predominant product of the following reaction?

(A)

(B)

(C)

(D)
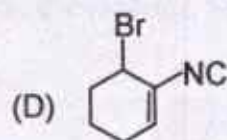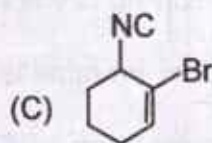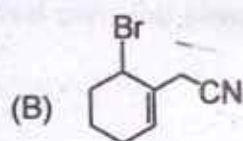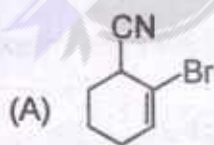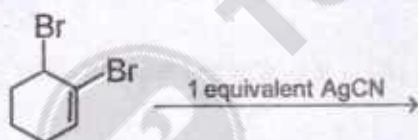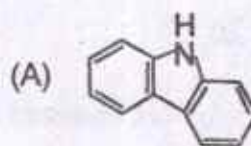
44. Least reactive nucleophile among the following is :
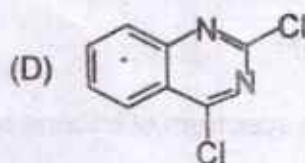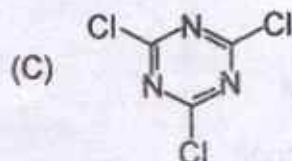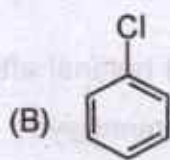
(A) Phenoxide ion

(B) Ethoxide ion

(C) Cyanide ion

(D) Sulphide ion

45. Most acidic species from the following is :
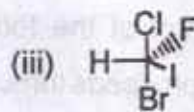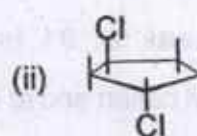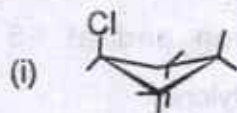
(A)

(B)

(C)

(D)
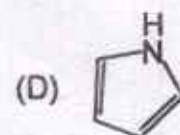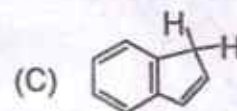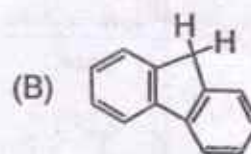
46. Which of the following will not react with KCN under normal S_NAr conditions ?

(A)

(B)

(C)

(D)
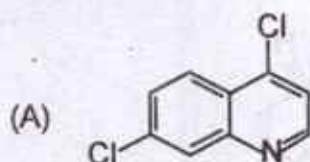
47. Least stable conformer of cyclohexane is :

(A) Boat form

(B) Chair form

(C) Twisted boat form

(D) Twisted chair form

48. Optically active species among the following is / are :
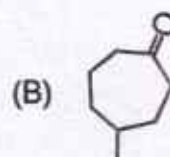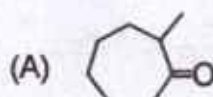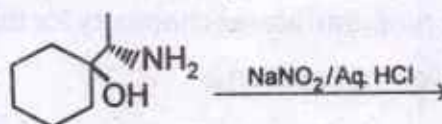
(i)

(ii)

(iii)

(iv)

(A) (i), (iii) and (iv)

(B) (ii) and (iii)

(C) (iv) only

(D) (iii) only

49. The Biginelli reaction which is an example of multicomponent reaction involves synthesis of :

(A) Amino acids

(B) Dihydro-Pyridine ring
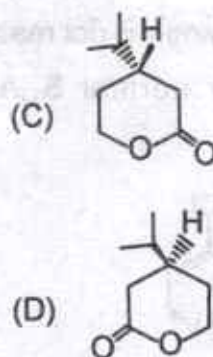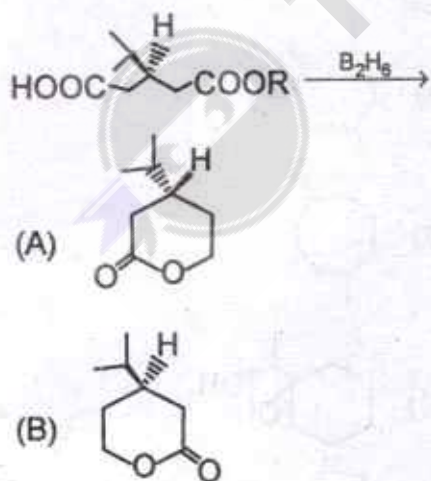
(C) Dihydro-pyrimidone ring

(D) Naphthalene ring

50. Which is the main final product of the following diazotization of the given amine ?

(A)

(B)

(C)

(D)
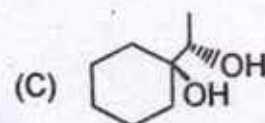
51. The final product of the following reaction which proceeds through the involvement of non-classical carbocation would be :

(A)

(B)

(C)

(D)
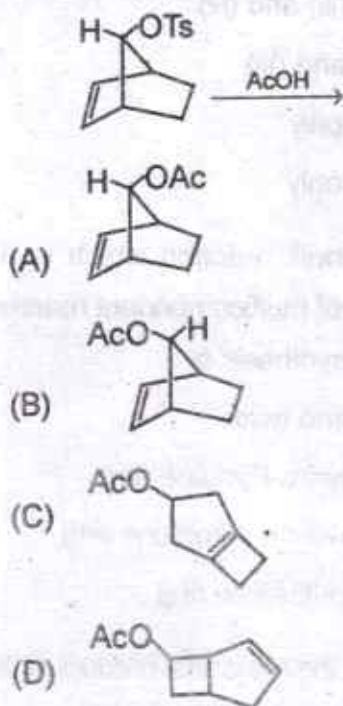
52. Predominant product with appropriate stereochemistry for the following reaction is :

(A)

(B)

(C)

(D)

53. The mass spectra of butanal after MacLaferty rearrangement give :

(A) Ethene

(B) Ethanol

(C) Heptanone

(D) Toluene

54. In the mass spectrum of toluene two strong peaks at m/e 91 and 65 are formed :

(A) The peak at 91 is due to acetylene and the peak at 65 is due to tropylium

(B) The peak at 91 is due to formation of tropylium cation and at 65 due to acetylene

(C) The peak at 91 is due to benzyl cation and at 65 due to acetylene

(D) The peak at 91 is due to benzoyl cation and at 65 due to acetylene

55. In the mass spectrum of Dodacan, the peak m/e 57 is due to :

(A) $C_3H_7^+$

(B) C_2H_5

(C) $C_4H_9^+$

(D) $C_6H_{13}^+$

56. In a linear molecule of CO_2, the total number of vibrational degrees of feeedom :

(A) 6

(B) 4

(C) 13

(D) 14

57. In an NMR absorption four isotopes C^{13} and N^{14} which option is correct for spin quantum number ?

(A) 3 and 1

(B) $\frac{1}{2}$ and $\frac{1}{2}$

(C) $\frac{1}{2}$ and 1

(D) $\frac{3}{2}$ and $\frac{5}{2}$

58. Choose the correct answer for Hermite polynomial if n = 2 :

(A) $H_2(\xi) = 8\xi^2 - 2$

(B) $H_2(\xi) = 8\xi^2 - 6$

(C) $H_2(\xi) = 6\xi^2 - 4$

(D) $H_2(\xi) = 4\xi^2 - 2$

59. How much is the rotational energy for second excited rotational state ?

(A) $8h^2 / 6\pi^2 I$

(B) $6h^2 / 8\pi^2 I$

(C) $4h^2 / 8\pi^2 I$

(D) $2h^2 / 6\pi^2 I$

60. Compare the angular momentum of molecule in third rotational state with the angular momentum of election 3d atomic orbital :

(A) $(6)^{\frac{1}{2}}\hbar$ and $(6)^{\frac{1}{2}}\hbar$

(B) $(2)^{\frac{1}{2}}\hbar$ and $(6)^{\frac{1}{2}}\hbar$

(C) $(8)^{\frac{1}{2}}\hbar$ and $(6)^{\frac{1}{2}}\hbar$

(D) $(6)^{\frac{1}{2}}\hbar$ and $(2)^{\frac{1}{2}}\hbar$

61. How much is the total π electron energy of 1, 3-butadiene ?

   (A) $4\alpha + 4.172\beta$

   (B) $2\alpha + 2.472\beta$

   (C) $4\alpha + 4.472\beta$

   (D) $2\alpha + 2\beta$

62. Which one is correct option for total π electron energy and delocalization energy of cyclobutadiene ?

   (A) $2\alpha + 2\beta$ and 2

   (B) $4\alpha + 6\beta$ and 0

   (C) $2\alpha + 4\beta$ and 4

   (D) $4\alpha + 4\beta$ and 0

63. What is the ground state term for the electronic configuration $3d^5$ Mn^{2+} and $5s^1 4d^4$ of Nb ?

   (A) ^6S and ^6D

   (B) ^6S and ^4F

   (C) ^2S and ^4F

   (D) ^6S and ^2F

64. How many values of M_j for $^1S_0$ and $^1P_1$ terms while Zeeman effect ?

   (A) 1 and 2

   (B) 0 and 3

   (C) 2 and 3

   (D) 1 and 1

65. How much is the Landes' g_j values for $^1P_1$ and $^1D_2$ terms ?

   (A) 2 and 2

   (B) 3 and 3

   (C) 0 and 1

   (D) 1 and 1

66. What are further splitted terms of ^3P when spin-orbit coupling takes place ?

   (A) $^3P_0$, $^3P_1$, $^3P_2$

   (B) $^3P_1$, $^3P_1$, $^3P_2$

   (C) $^3P_1$, $^3P_1$, $^3P_3$

   (D) $^3P_2$, $^3P_1$, $^3P_2$

67. What do you understand by activity of a substance ?

    (A) It is the ratio of fugacity of substance in that pure state to the fugacity of the same substance in that state

    (B) It is the ratio of fugacity of substance in that state to the fugacity of the same substance in the pure state

    (C) Both (A) and (B) are correct

    (D) None of these

68. Which relation is correct for fugacity of a gaseous mixture ?

    (A) $\mu_i = \mu_i^* + RT \ln f_i$

    (B) $\mu_i = \mu_i^* + RT \ln f_i^o$

    (C) $\mu_i^o = \mu_i^* + RT \ln f_i$

    (D) $\mu_i = \mu_i^* + R \ln f_i$

69. What are the inversion temperatures of hydrogen and helium gas ?

    (A) -48^oC and -2342^oC

    (B) -78^oC and -242^oC

    (C) -48^oC and -242^oC

    (D) -58^oC and -142^oC

70. Calculate ΔU, ΔH and W for isothermal expansion of an ideal gas :

    (A) $0, 1, -0$

    (B) $1, 0, -q$

    (C) $0, 0, -1$

    (D) $0, 0, -q$

71. Choose the correct statement for Fermi-Dirac statistics :

    (A) Particle are distinguishable and any number of particle may occupy same energy level.

    (B) Particles are distinguishable and only one particle may occupy given energy level.

    (C) Particle are indistinguishable and any number of particle may occupy given energy level.

    (D) All of these

72. How much is the electronic partition function for $2p^1$ electron ?

    (A) 3

    (B) 4

    (C) 2

    (D) 1

73. Equal masses of polymer molecule, with M_1 is equal to 10,000 and M_2 is equal to 100,000 are mixed. Calculate the number average molar mass and mass average molar mass :

(A) 1,781 and 54,000

(B) 1,900 and 56,000

(C) 18181 and 55,000

(D) None of these

74. Which is correct for syndiotactic polymer ?

(A) All the asymmetric carbon atom have same d or l configuration.

(B) The polymer has random sequence of d or l configuration.

(C) Polymer has regular alternate d or l configuration.

(D) All of these

75. What is Meissner effect ?

(A) Superconductor does not allow magnetic field to pass through it.

(B) Superconductor allow magnetic field to pass through it.

(C) Superconductor allow electric field to pass through it.

(D) None of these

76. What do you understand by phonon ?

(A) It is a quantum of radiation evolved when transition takes place from lower vibration to higher vibrational state.

(B) It is a quantum of thermal radiation evolved when transition takes place from higher vibration to lower vibrational state.

(C) They are the short lived species.

(D) Both (B) and (C)

77. Butler-Volume equation is :

(A) $I = i_o \{e^{(1-\alpha)\eta F/RT} - e^{-\alpha\eta F/RT}\}$

(B) $I = i_o \{e^{(1-\alpha)F/RT} - e^{-\alpha\eta F/RT}\}$

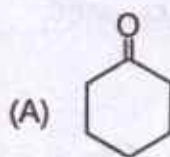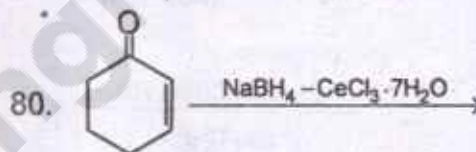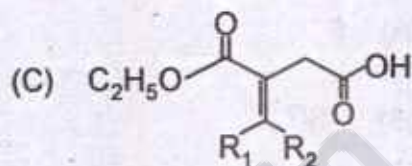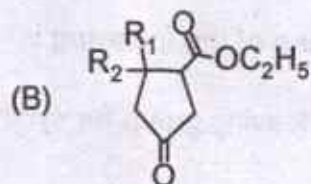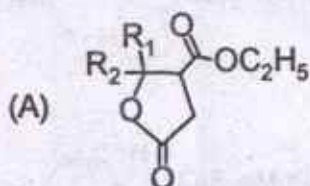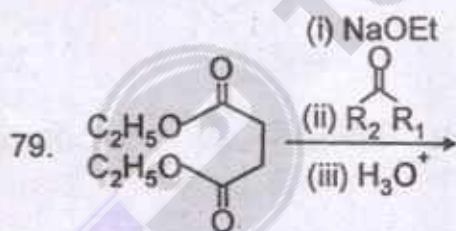(C) $I = i_o \{e^{(1-\alpha)\eta F/RT} - e^{-\alpha\eta/RT}\}$

(D) $I = i_o \{e^{(1-\alpha)\eta F/R} - e^{-\alpha\eta F/RT}\}$

78. In the following reaction sequence the number of participated π electron participated and pericyclic mode of reaction is :
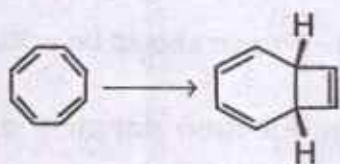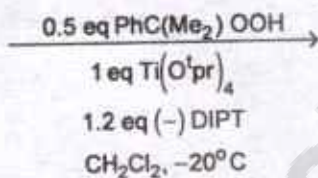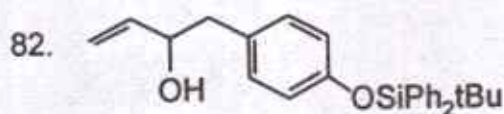

(A) $4\pi - \Delta$ – Disrotation and

$6\pi - \Delta$ – Disrotation

(B) $4\pi - \Delta$ – Disrotation and

$6\pi - h\upsilon$ – Conrotation

(C) $4\pi - h\upsilon$ – Disrotation and

$6\pi - h\upsilon$ – Conrotation

(D) $4\pi - h\upsilon$ – Disrotation and

$6\pi - \Delta$ – Disrotation

79.

(i) NaOEt

(ii) $R_2 R_1$

(iii) H_3O^+

(A)

(B)

(C)

(D)

80.

 $\xrightarrow{NaBH_4 - CeCl_3 \cdot 7H_2O}$

(A)

(B)

(C)
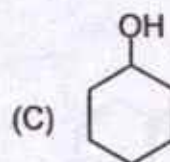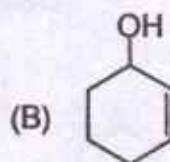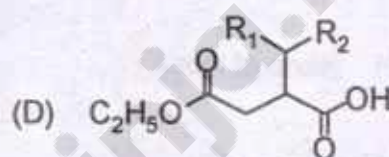
(D) All of these

81. Which one of the following is not a suitable leaving group for synthesis of a Hofmann product ?

(A) F^-

(B) $^+SR_3$

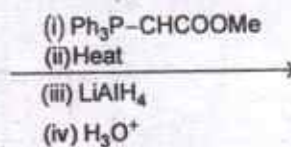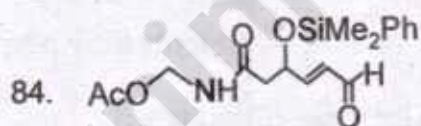(C) I^-

(D) None of these

82.

$$\xrightarrow[\substack{1\,eq\,Ti(O^tpr)_4 \\ 1.2\,eq\,(-)\,DIPT \\ CH_2Cl_2,\,-20^\circ C}]{0.5\,eq\,PhC(Me_2)\,OOH}$$

(A)

(B)

(C)

(D) All of these

83. Which of the following statement is correct for E1CB reaction ?

(A) Good leaving group

(B) Proton should be acidic

(C) Electron donating group at β-carbon

(D) All of these

84.

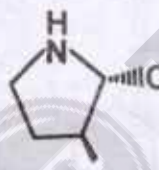$$\xrightarrow[\substack{(iii)\,LiAlH_4 \\ (iv)\,H_3O^+}]{\substack{(i)\,Ph_3P-CHCOOMe \\ (ii)\,Heat}}$$
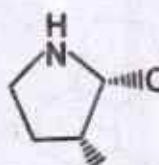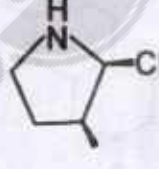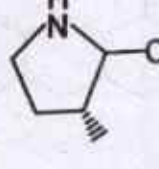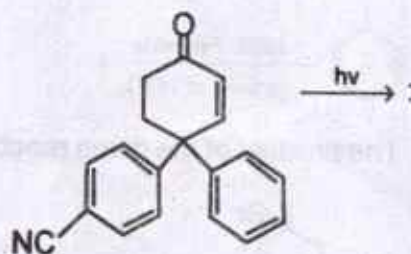
(A)

(B)

(C)

(D)

85. Which one of the following statement is correct for the pyrolytic elimination ?

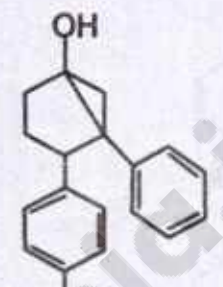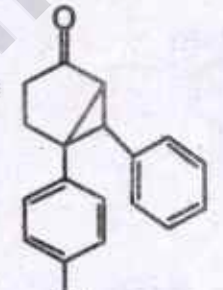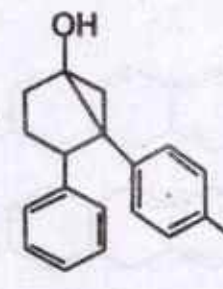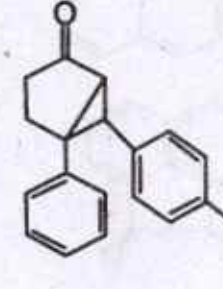(A) When base exist as ion pair

(B) Norbornane system

(C) Crown either

(D) All of these

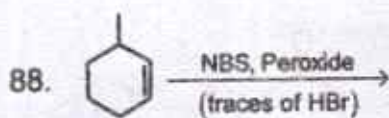86. $\xrightarrow[\text{(ii) } H_2SO_4]{\text{(i) }^tBuOCl}}$:
(iii) hv
(iv) NaOH

(A)

(B)

(C)

(D)

87. $\xrightarrow{hv}$:

(A)

(B)

(C)

(D)

88.
$$\xrightarrow[\text{(traces of HBr)}]{\text{NBS, Peroxide}}$$
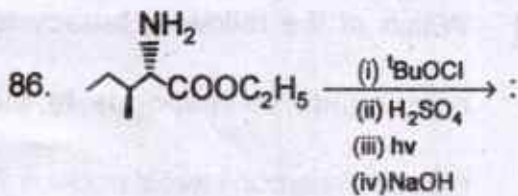
The product of the given reaction is :

(A)

(B)

(C)

(D)

89.
$$\xrightarrow[\text{(ii) DDQ}]{\text{(i) AlCl}_3} X$$

X is :

(A)

(B)

(C)

(D)
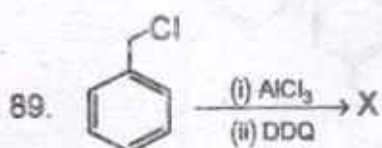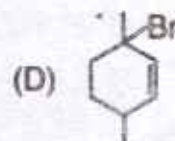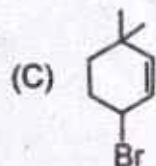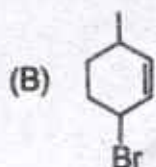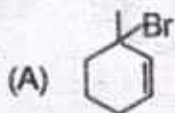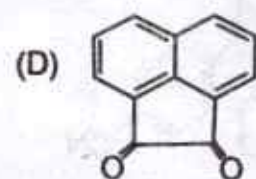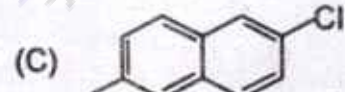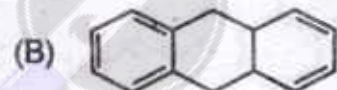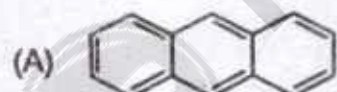
90. Which of the following is not an example of multicomponent reaction ?

(A) Biginelli reaction

(B) Passerini reaction

(C) Diels-Alder reaction

(D) Ugi reaction

91. Which of the following tetracyclic compounds corresponds to the typical 17-carbon steroid nucleus ?

(A)

(B)

(C)

(D)

92. Match the following :

Partition function   Relation

(i)   Translational   (a) $(8\pi^2 lkT/h^2)$

(ii) Rotational   (b) g_0

(iii) Vibrational   (c) $(2\pi mkT/h^2)^{3/2} V$
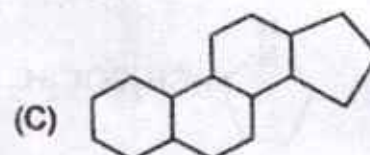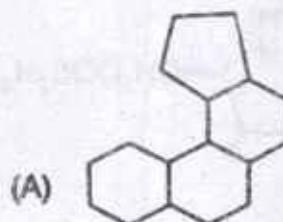
(iv) Electronic   (d) $(1/(1-e^{-hc\bar{\omega}/kT}))$

(A) (i) – (a), (ii) – (c), (iii) – (d), (iv) – (b)

(B) (i) – (c), (ii) – (a), (iii) – (d), (iv) – (b)

(C) (i) – (a), (ii) – (c), (iii) – (b), (iv) – (d)

(D) (i) – (a), (ii) – (d), (iii) – (c), (iv) – (b)

93. The value of constant of integration for Box normalized momentum eigen function is :

(A) $\dfrac{1}{\sqrt[2]{L}}$

(B) $\dfrac{1}{\sqrt{L}}$

(C) $\dfrac{1}{\sqrt{\pi}}$

(D) $\dfrac{1}{\sqrt{2\pi}}$

94. A certain 2-level system lies stationary state energy $E_1^{(0)} = -10$ and $E_2^{(0)} = 0$ with normalized wavefunction $\psi_1^{(0)}$ and $\psi_2^{(0)}$ respectively.

A small perturbation V is applied on the system such that $V_{12} = 2$. The wavefunction of the particle in ground state collected upto first order, will be :

(A) $\psi_1^{(1)} = \psi_2^{(0)}$

(B) $\psi_1^{(1)} = \psi_1^{(0)} - \frac{1}{10} \psi_2^{(0)}$

(C) $\psi_1^{(1)} = \psi_1^{(0)} + \frac{1}{5} \psi_2^{(0)}$

(D) $\psi_1^{(1)} = \psi_1^{(0)} - \frac{1}{5} \psi_2^{(0)}$

95. Match the following :

Type of   Distance
Interaction   dependence

(i)   Dipole-dipole   (a) $1/r$

(ii) Charge-dipole   (b) $1/r^2$

(iii) Charge-   (c) $1/r^3$
      induced dipole

(iv) Charge-charge   (d) $1/r^4$

(A) (i) – (a), (ii) – (b), (iii) – (d), (iv) – (c)

(B) (i) – (b), (ii) – (a), (iii) – (d), (iv) – (c)

(C) (i) – (c), (ii) – (b), (iii) – (d), (iv) – (a)

(D) (i) – (d), (ii) – (b), (iii) – (a), (iv) – (c)

96. What is the range of values between the parameter ($V/l_{max}a$) and the structure of cylindrical shape micelle ?

(A) 0

(B) $1/5 - 1/4$

(C) $1/3 - 1/2$

(D) 1

97. In the presence of excess added electrolyte, with mole fraction x, the free energy of micellization is given by the expression :

(A) $\Delta G_m^0 = RT \ln [cmc] + \{1 - (n/p)\} \ln x$

(B) $\Delta G_m^0 = RT \ln [cmc] - \{1 - (p/n)\} \ln x$

(C) $\Delta G_m^0 = RT \ln [cmc] - \{1 - (n/p)\} \ln x$

(D) $\Delta G_m^0 = RT \ln [cmc] + \{1 - (p/n)\} \ln x$

98. What is the value of slope for the Lippmann equation that gives the relation between changes of surface tension and changes of cell potential ?

(A) q_m

(B) $-q_m$

(C) q_m^{-1}

(D) $-q_m^{-1}$

99. Which of the following is correct relation for the distribution coefficient that used in Langmuir adsorption isotherm ?

(A) $\left(\dfrac{1-\theta}{\theta}\right)\dfrac{1}{p}$

(B) $\left(\dfrac{1-\theta}{\theta}\right)p$

(C) $\left(\dfrac{\theta}{1-\theta}\right)\dfrac{1}{p}$

(D) $\left(\dfrac{\theta}{1-\theta}\right)p$

100. Which one is the correct relation between partition function and Gibbs free energy for one mole of ideal gas ?

(A) $G = -RT \ln (q_m/N_A)$

(B) $G = -RT \ln (N_A/q_m)$

(C) $G = RT \ln (q_m/N_A)$

(D) $G = RT \ln (N_A/q_m)$

■■■■■■■■■■■■■■■

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK