21108 **90 MINUTES**

1. The angular part of the d_{xy} orbital of a hydrogen-like system, ignoring the normalization constant is
   A) $R(r)\ (3\cos^2\psi-1)$ B) $R(r)\ \sin\theta\cos\theta\ \cos\psi$
   C) $R(r)\ \sin^2\theta\ \sin2\psi$ D) $R(r)\ \sin\theta\ \cos\theta\ \sin\psi$

2. The term symbol for the ground state of carbon atom is
   A) $^3P_{1/2}$ B) $^2P_{3/2}$
   C) ^3P_o D) $^4S_{3/2}$

3. Pick out the pair of conjugate elements for the C_{3v} point group
   A) C_3^1 and C_3^2 B) C_3^2 and σ_{V2}
   C) C_3^1 and σ_{V1} D) C_3^1 and σ_{V2}

4. The dimension of Plank's constant is
   A) $[MLT^{-1}]$ B) $[ML^2T^{-1}]$
   C) $[M^2L^2T^{-1}]$ D) $[ML^2T]$

5. For the water molecule, the IR-active modes and Raman-active modes are
   A) A_1 and B_1 B) A_1 and E
   C) B_1 and E D) A_1 and B_2

6. The ESR spectrum of isopropyl radical ($C_3H_7^{\cdot}$) shows
   A) 62 lines B) 36 lines
   C) 24 lines D) 14 lines

7. The high-resolution nmr spectrum of propanoic acid shows
   A) Two singlet and one quartet
   B) Three singlet
   C) One singlet, one quartet and one triplet
   D) One singlet, one quartet and one doublet

8. Which of the following radiations has the lowest energy?
   A) Radio wave B) Infra red
   C) X-ray D) Microwave

9. The molecule having 4 vibrational degree of freedom is
   A) H_2O B) H_2S
   C) SO_2 D) CS_2

10. Which of the following statements is not correct?
   A) The number of collision is proportional to the square root of temperature
   B) The number of collision is proportional to the square root of pressure
   C) The number of collision is proportional to the square of no. of molecules
   D) The number of collision increases with decrease in molecular weight

11. The order of mean free path for most of the gases at atmospheric pressure at 0 ^{o}C is

A) 10^{-6} cm B) 10^{-5} cm

C) 10^{-8} cm D) None of the above

12. v_p, $\bar{v}$ and $\left(\bar{v}^2\right)^{1/2}$ are the most probable velocity , the arithmetic mean velocity and the root mean square velocity respectively for H_2 at 0^{o}C. Then

A) $\left(\bar{v}^2\right)^{1/2} < \bar{v} < v_p$ B) $\bar{v} < \left(\bar{v}^2\right)^{1/2} < v_p$

C) $v_p < \bar{v} < \left(\bar{v}^2\right)^{1/2}$ D) $\bar{v} < v_p < \left(\bar{v}^2\right)^{1/2}$

13. State the degree of freedom in the light of the phase rule in each of the following systems.

(i) An azeotrope in a binary system (ii) A pure substance at its critical point

(iii) solid $CaCO_3$ is heated in a sealed tube (iv) An eutectic mixture in a binary system

A) (i) 1 (ii) 0 (iii) 1 (iv) 0 B) (i) 1 (ii) 0 (iii) 2 (iv) 0

C) (i) 2 (ii) 1 (iii) 0 (iv) 1 D) (i) 1 (ii) 0 (iii) 1 (iv) 2

14. Which of the following equations is used to calculate the rotational partition function (z rot) for nonlinear polyatomic molecules?

A) $z_{rot} = . \frac{\sqrt{\pi}}{\sigma}\left(\frac{8\pi^2 k_B T}{h^2}\right)^{3/2}(I_A I_B I_C)^{1/2}$

B) $z_{rot} = \frac{\sqrt{\pi}}{\sigma}\left(\frac{8\pi^2 k_B T}{h^2}\right)^{3/2}(I_A I_B I_C)^{3/2}$

C) $z_{rot} = \frac{\sqrt{\pi}}{\sigma}\left(\frac{8\pi^2 k_B T}{h^3}\right)^{1/2}(I_A I_B I_C)^{3/2}$

D) $z_{rot} = \frac{\sqrt{\pi}}{\sigma}\left(\frac{8\pi^2 k_B T}{h^2}\right)^{3/2}(I_A + I_B + I_C)^{1/2}$

15. Which of the following statements is true?

A) $\Delta S_{universe} = \Delta S_{system} - \Delta S_{surroundings}$

B) Since dS = dq/T and dq = 0 for adiabatic change, therefore dS is always zero whether the process is reversible or irreversible

C) At absolute zero the entropy of every substance is zero

D) The equation Cp- Cv = $VT\alpha^2/\beta$ is valid for solids, liquids and gases

16. Which one of the following is a criterion for spontaneous process?

A) $\Delta G > 0$ B) $\Delta G \geq 0$ C) $\Delta G = 0$ D) $\Delta G < 0$

17. Consider the following statement about the reaction

$PCl_5\,(g) \longrightarrow PCl_3\,(g) + Cl_2\,(g)$

i) $k_p < k_c$ ii) $k_p > k_c$ iii) ΔH is +ve iv) ΔS of the reaction is +ve

Of the above statements which is/are correct?

A) i, iii and iv B) ii, iii and iv C) i and iv D) ii and iii

18. Among the following reactions, which will be favored at low pressure ?

A) $H_2 + I_2 \rightleftharpoons 2\,HI$

B) $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

C) $N_2 + 3H_2 \rightleftharpoons 2\,NH_3$

D) $N_2 + O_2 \rightleftharpoons 2\,NO$

19. Volume of the system can be represented as

A) $\left(\frac{\partial H}{\partial S}\right)_P$ B) $\left(\frac{\partial H}{\partial P}\right)_S$

C) $\left(\frac{\partial E}{\partial V}\right)_T$ D) $\left(\frac{-\partial E}{\partial V}\right)_S$

20. The Joule-Thomson coefficient of a gas, $\left(\frac{\partial \mathrm{T}}{\partial \mathrm{P}}\right)_{\mathrm{H}}$, is evaluated at constant

A) Enthalpy B) Entropy
C) Volume D) Energy

21. Choose the wrong statement

A) The electronic partition function is equal to the statistical weight factor
B) Fermion and boson probability distributions become more and more like the Boltzmann distribution as the energy increases
C) The entropy increases with increasing molar mass
D) Molecular partition functions are exactly factored into translational, rotational and vibrational and electronic factors

22. Inversion temperature of helium is

A) – 80 °C B) – 240 °C
C) – 74 °C D) – 234 °C

23. Which of the following is an endothermic reaction?

A) $H_2\,(g) + 1/2\,O_2\,(g) \longrightarrow H_2O\,(l)$

B) $H_2\,(g) + 1/2\,O_2\,(g) \longrightarrow H_2O\,(steam)$

C) $C\,(graphite) + 2\,S\,(rhombic) \longrightarrow CS_2$

D) $C\,(diamond) + O_2\,(g) \longrightarrow CO_2\,(g)$

24. Which of the following statement is wrong?

A) An ampere is a rate of flow of electric current of one coulomb per second
B) The coulomb is the quantity of electricity required to deposit 1 gram equivalent of silver
C) The quantity of electricity required to deposit one gram equivalent of an element in 96500 coulombs
D) The unit of electrochemical equivalent is grams

25. A reaction that does not occur at the cathode is

A) $H^+ + e^- \longrightarrow H$

B) $Fe^{3+} + e^- \longrightarrow Fe^{2+}$

C) $2\,H_2O + 2\,e^- \longrightarrow H_2 + 2\,OH^-$

D) $H_2O + e^- \longrightarrow H_2 + O_2^{2-}$

26. Choose the correct statement
Electrode potential of an element is independent of

A) Concentration of the ions of the element in solution
B) Nature of the element
C) Electronic configuration of the element
D) Stochiometric coefficients of the species in the electrode half reaction

27. The stannic – stannous electrode system is represented as

A) $Sn^{4+}{}_{1M} / Sn^{2+}{}_{1M}$
B) $Sn^{2+}{}_{1M} / Sn^{4+}{}_{1M}$
C) $Pt / Sn^{4+}{}_{1M} / Sn^{2+}{}_{1M}$
D) $Sn_{(solid)} / Sn^{4+}{}_{1M} / Sn^{2+}{}_{1M}$

28. In the Nickel-Cadmium (NICAD) cell, NiO_2 is

A) The cathode in the discharging period
B) The anode in the discharging period
C) The cathode in the charging period
D) Polariser

29. Calomel electrode is reversible with respect to

A) K^+ion B) Cl^- ions C) Hg^{2+} ions D) Calomel

30. To obtain a straight line with a slope equal to the rate constant k for the decomposition of phosphine (P) on molybdenum surface at high pressure, one should plot ------ as a function of time

A) P B) P^2 C) 1/P D) ln P

31. The unit of the rate constant of the reaction
$H_2 + D_2 \longrightarrow 2\,HD$ is

A) mol L^{-1} S^{-1} B) L mol^{-1} S^{-1}
C) $L^{3/2}$ $mol^{1/2}$ S^{-1} D) S^{-1}

32. The H_3O^+-catalysed ester hydrolysis ($CH_3COOR' + H_2O \longrightarrow R\,COOH + R'OH$) is an example of

A) General acid – base catalysis
B) Specific acid catalysis
C) Enzyme catalysis
D) Auto catalysis

33. For an adsorption process obeying Freundlich isotherm equation, which one of the following plot is linear (q_e = amount adsorbed at equilibrium and C_e = equilibrium concentration) ?

A) q_e vs C_e B) C_e/q_e vs C_e
C) ln q_e vs ln C_e D) q_e vs $1/C_e$

34. Number of molecules adsorbed in a single layer (v_m) can be calculated using BET plot as

A) $v_m = \frac{1}{\text{slope}}$ B) Antilog of the intercept
C) $\frac{1}{(\text{slope} + \text{intercept})}$ D) $\frac{1}{(\text{slope x intercept})}$

35. The number of tetrahedral holes in a cubic close-packed array of 'n' atoms is

A) 0 B) n/2
C) n D) 2n

36. Miller indices of a face such that it is perpendicular to the axis is

A) (1, 1, 2) B) (1, 0, 0)
C) (0, 1, 0) D) (0, 0, 1)

37. Which of the following X-ray diffraction methods can be used to determine the symmetry and orientation of crystals, mainly those with imperfect morphology?

A) Bragg's spectrometer
B) Laue's photographic method
C) Weissenberg rotating crystal method
D) Debye and Scherer powder method

38. Lubricating properties of graphite are diminished in

A) High pressure B) Low pressure
C) Vacuum D) None of these

39. Which of the following pairs of ions have the same ionic radii?

A) Ti^{4+} Zr^{4+} B) Ti^{4+} Sn^{4+}
C) Ti^{4+} Te^{4+} D) Ti^{4+} Th^{4+}

40. Which of the following trivalent lanthanide ions is diamagnetic?

A) Eu^{3+} B) Gd^{3+}
C) Lu^{3+} D) Yb^{3+}

41. A result of lanthanide contraction

A) Electropositive character of the coinage metals decrease from Cu to Au
B) Lanthanides form stable complexes
C) Zr and Hf are chemically much more similar to each other than either elements is to Ti
D) Atomic radius of W is larger than that of Mo

42. The catalyst used in the preparation of adipic acid using cyclohexanol / cyclohexanone mixture for nylon 66 is
A) Fe/Mo B) Pd/PtO
C) Pt/Rh D) Cu/V

43. Actinide contraction relates to
A) Ionic radii B) Density
C) Valence electron D) Nuclear masses

44. Which of the following f-block elements form MO_2 type oxide on heating in oxygen?
A) Pr B) Lu C) Ce D) Sm

45. Iodine hepta fluoride has which of the following hybridization?
A) d^2sp^3 B) dsp^3 C) sp^3d^2 D) sp^3d^3

46. The intense color of Ce^{4+} solution is due to
A) f-f transition
B) Intra-ligand charge transfer transition
C) Ligand to metal charge transfer transition
D) Metal to ligand charge transfer transition

47. Which one of the following is inert?
A) $Co(CN)_6^{3-}$ B) CoF_6^{3-}
C) FeF_6^{3-} D) $V(OH)_6^{3+}$

48. The isomerism exhibited between the following pair is
$[Pt(NH_3)_4Cl_2]$ $[PtCl_4]$ and $[Pt(NH_3)_4]$ $[PtCl_6]$
A) Ionization isomerism B) Geometrical isomerism
C) Linkage isomerism D) Coordination isomerism

49. The conjugate base of $[Co(H_2O)_6]^{3+}$ is
A) Co^{3+} B) CoO_3^{3-}
C) OH^- D) $[Co(H_2O)_5(OH)]^{2+}$

50. Which of the following combinations can be regarded as hard acids?
A) NCS^- and Hg^{2+} B) CN^- and Au^+
C) SCN^- and Mn^{2+} D) Cu^+ and CN^-

51. The number of different isomers possible in the octahedral coordination complex $[Co(NH_3)_3(H_2O)Cl_2]^+$ is
A) 3 B) 2
C) 4 D) 5

52. The number of unpaired electrons in Fe^{2+} ions in a weak O_h field and strong O_h field are
A) 5 and 0 B) 2 and 3
C) 4 and 0 D) 2 and 0

53. Which of the following ligands is used to remove copper from patients suffering from Wilson's disease?

A) Tropolone B) Salicylaldimine
C) *D*-Penicillamine D) Dithiocarbamate

54. The lowest Δ_o is associated with

A) $[Cr\ Cl_6]^{3-}$ B) $[Cr(H_2O)_6]^{3+}$
C) $[Cr(NH_3)_6]^{3+}$ D) $[Cr(CN)_6]^{3+}$

55. The Δ_o value of $[CoCl_6]^{4-}$ is 18, 000 cm^{-1}. The Δ_o value of $[CoCl_4]^{2-}$ is

A) 8000 cm^{-1} B) 8500 cm^{-1}
C) 13500 cm^{-1} D) 18,000 cm^{-1}

56. The magnetic moment of $[Ti(H_2O)_6]^{3+}$ is

A) Zero B) 1.73 BM C) 3.18 BM D) 5.58 BM

57. Which of the following carbonyls is paramagnetic?

A) $V(CO)_6$ B) $Cr(CO)_6$ C) $Mo(CO)_6$ D) $W(CO)_6$

58. A d-d transition is multiplicity forbidden in

A) d^3 B) d^5 C) d^6 D) d^2

59. Which among the following has orbital contribution to magnetic moment?

A) $t_{2g}^3\ eg^o$ B) $t_{2g}^3\ eg^1$ C) $t_{2g}^3\ eg^2$ D) $t_{2g}^4\ eg^2$

60. The $[Cr(H_2O)_6]^{2+}$ ion has an absorption band at about 630 nm. Which of the following colors is most likely to describe this ion?

A) Sky Blue B) Yellow
C) Green D) Deep Red

61. To calculate the μ_{SL}, the values of S and L for Cr^{3+} and Fe^{3+} are

A) 3/2 and 3, 4/2 and 0 B) 5/2 and 2, 2/2 and 3
C) 3/2 and 3, 5/2 and 0 D) 1/2 and 2, 5/2 and 2

62. The ground terms for high-spin and low-spin d^6 configurations in O_h symmetry are

A) ^3D and ^2F B) ^3D and ^1I
C) ^5D and ^2F D) ^5D and ^1I

63. Which of the following decay with change in multiplicity is known as ISC?

A) $S_1 \rightarrow T_1$ B) $S_1 \rightarrow S_0$
C) $S_2 \rightarrow S_1$ D) $T_2 \rightarrow T_1$

64. The peak observed at 2150 cm-1 in the IR spectrum of a compound indicates the presence of

A) ─C≡C─ B) ─C≡N
C) >N─H D) ─S─H

65. Which one of the following statements w. r. t mass spectrometry is false?
A) The presence of the P + 1 peak may be attributable to the natural abundance of ^{13}C
B) For oxycompounds, a P + 2 peak may be attributable to the natural abundance of ^{18}O
C) For compounds with N atoms, some of the P + 1 peak may be due to natural abundance of ^{15}N
D) For organic compounds with N atoms, a P + 2 peak could arise from the presence of ^{15}N and ^{13}C

66. Limiting current in polarography depends on
A) Residual current B) Diffusion current
C) Kinetic current D) All the above

67. Which of the following is not true of optical isomers?
A) Enantiomers have no plane of symmetry
B) Meso forms have plane of symmetry
C) Enantiomers are superimposable mirror images
D) Diasteromers are non-superimposable mirror images

68. Stigmasterol contains
A) Two hydroxyl groups and two double bonds
B) One hydroxyl group and two double bonds
C) Two hydroxyl groups and three double bonds
D) One hydroxyl groups and one double bond

69. Select the reactions that might be used in uv rate study
1. $CH_3CH_2CH_2Cl + NH_3 \rightarrow CH_3CH_2CH_2NH_3^+ + Cl^-$
2. $CH_3CH_2COCH_3 + H_2 \rightarrow CH_3CH_2CH(OH)CH_3$
3. $CH_2=CHCH=CH_2 + CH \equiv CH \rightarrow$ 1,4-cyclohexadine
4. $CH_3CH_2CH(OH)CH_2CH_3 \rightarrow CH_3CH_2CH=CHCH_3$

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

70. Benzoic acid reacts with a mixture of Na in liquid NH_3 and EtOH. Identify the product
A) 1,4-cyclohexadiene-3 caboxylic acid
B) 2, 5- cyclohexadiene 1-carboxylic acid
C) 1, 4-cyclohexadiene-3-ol
D) 2-hydroxybenzaldimine

71. The acidity decreases in the order as follows
A) m-nitrobromophenol > m-bromophenol > phenol > cresol
B) m-nitrobromophenol > phenol > m-bromophenol >cresol
C) cresol > phenol > m-nitrobromophenol > m-bromophenol
D) cresol > m-nitrobromophenol > m-bromophenol > phenol

72. The decreasing order of resonance energies (stabilities) of aromatic, antiaromatic and nonaromatic compounds is
A) Aromatic > Antiaromatic > Nonaromatic
B) Aromatic > Nonaromatic > Antiaromatic
C) Antiaromatic > Aromatic > Nonaromatic
D) Nonaromatic > Antiaromatic > Aromatic

73. Give the relative order of down field shift (δ values) of aldehydic, aryl, vinylic, and acetylenic H's compared to an alkyl H.
A) Aldehydic > Vinylic > Aryl > Acetylenic > Alkylic
B) Aryl > Vinylic > Aldehydic > Acetylenic > Alkylic
C) Aldehydic > Aryl > Alkylic > Vinylic > Acetylenic
D) Aldehydic > Aryl > Vinylic > Acetylenic > Alkylic

74. Which of the following statements is correct with respect to the carbanions?
A) The carbon carrying the charge has even number of valence electrons
B) They are formed homolytic fission
C) They have distorted octahedral structure
D) The hybrid of carbon in carbanion is sp^2

75. The conversion of an enolizable, I, 4-diketone into 2, 5-disubstituted trophenes can be achieved by:
A) Barton reaction B) Paal-Knorr reaction
C) Skraup reaction D) Pfitzinger reaction

76. 'Three Carbon Protropy' is observed in the conversion of
A) α–carotene into β -carotene B) β –carotene into α -carotene
C) β–carotene into γ-carotene D) α –carotene into γ-carotene

77. The 'N' atom in pyrrole is
A) sp^3 hybridized B) sp^2 hybridized
C) sp hybridized D) cannot be predicted

78. Which of the following alkaloids containing the isoquinoline unit?
A) Papaverine B) Codeine
C) Quinine D) Ephedrine

79. Which of the following compounds can be obtained in an optically active form?
(i). Menthol (ii). Camphor (iii). Lanalool (iv). Pepaverine
A) (i) and (ii) B) (i), (ii) and (iii)
C) (iii) and (iv) D) (i), (ii) and (iv)

80. The reagent used in Dickmann condensation is
A) Anhy. $AlCl_3$ B) $Al(OCH\ Me)_3$
C) C_2H_5ONa D) KNH_2 in Liquid NH_3

81. Which of the following reagents is used in hydroboration reaction?

A) BH_3 B) BCl_3
C) #THF-BH_3 D) DMSO-BH_3

82. Which of the following statements is correct with respect to the cholesterol?

A) Cholesterol is derived from lanosterol by a process that removes two methyl groups
B) Cholesterol is not a triterpene
C) Cholesterol contains 30-carbons and 6 isoprene units
D) Cholesterol is more properly referred as norsesquiterpene

83. 3-[(S)-2-pyrrolidinyl] pyridine is known as

A) Norcytisine B) Norpelletierine
C) Norcocaine D) Nornicotine

84. Identify the correct order of stability

A) $Me^+ < Ph\ CH_2^+ < Ph_2\ CH^+ < Ph_3\ C^+$
B) $Me^+ < Ph_3\ C^+ < Ph_2\ CH^+ < Ph\ CH_2^+$
C) $Ph_3\ C^+ < Ph_2\ CH^+ < Ph\ CH_2^+ < Me^+$
D) $Ph\ CH_2^+ < Ph_2\ CH^+ < Ph_3\ C^+ < Me^+$

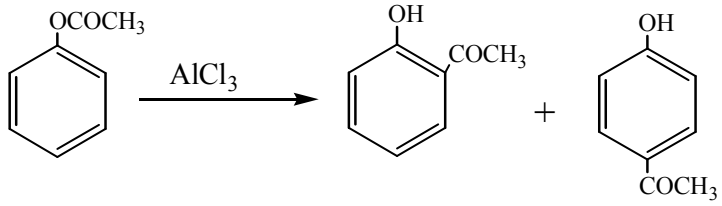
85. The priority sequence for assigning R,S configuration to lactic acid is

A) $-CH_3$, -COOH, -OH, -H B) –OH, -COOH, $-CH_3$, -H
C) –COOH, -OH, $-CH_3$, -H D) –OH, $-CH_3$, -COOH, -H

86. Choose the false statement

A) Conformational isomers are always superimposable
B) Meso compounds are optically inactive because they have chiral centers but internally compensated
C) D(+)-glucose is represented as 2(R), 3(S), 4(R), 5(R), 6-pentahydroxyhexanal
D) A pair of diastereomers can also act as a pair of optical isomers

87. The reaction



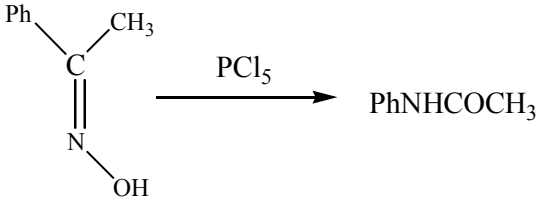
is known as

A) Claisen's rearrangement B) Schmidt reaction
C) Curtius rearrangement D) Fries rearrangement

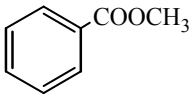
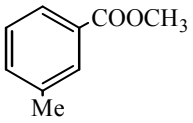
88. The reactive intermediate in a typical Hoffmann rearrangement is a

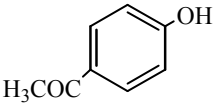
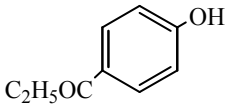
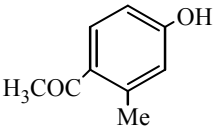
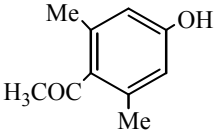
A) Benzyne B) Nitrene
C) Dienone D) Carbene

89. The following reaction is



A) Regioselective and stereospecific
B) Non regioselective and stereospecific
C) Neither regioselective and non stereospecific
D) Regioselective and non –stereospecific

90. A mixture of  and  on treatment with $AlCl_3$ gives a mixture of products. The compound which is not present in the mixture of products is

A) 
B) 
C) 
D 

91. When hydrolysed by dilute acids, lactose gives

A) Glucose and mannose B) Glucose and fructose
C) Glucose and galactose D) Glucose and arabinose

92. Choose the false statement

A) Barton reaction involves photolysis of long chain alkyl nitrites having δ- hydrogen
B) Photolysis of ketones involving cyclic transition state followed by abstraction of γ – hydrogen and cleavage is known as Norrish type – II process
C) Electronic transitions, n → π* and π→ π*, can be seen in saturated aldehydes and ketones
D) Conversion of ketone into oxetane in presence of light is known as photochemical reduction reaction

93. Glucose and fructose on reaction with phenyl hydrazine form the same ozazone. Hence these molecules have

A) The same configuration at C_1 and C_2
B) Different configuration at C_3 through C_6
C) Different configuration at C_1 and C_2
D) Different configuration at C_1 alone

94. Amino acid gives a coloured product when its HCl solution is treated with ninhydrin

A) Alanine B) Proline
C) Tryptophan D) Tyrosine

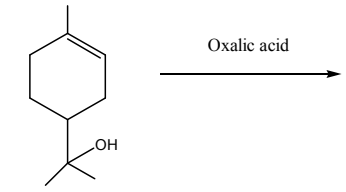
95. Dehydrogenation of cholesterol with selenium generates

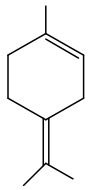
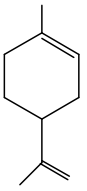
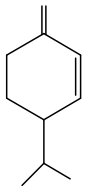
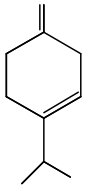
A) Chrysene B) Pyrene
C) Picene D) Perylene

96. Atropine is prepared by heating the mixture of reactants A and B in the presence of hydrogen chloride. The reactant A is tropine and the reactant B is

A) Tropic acid B) Pimelic acid
C) Tropinic acid D) Tropinone

97. The product formed in the following reaction is



A)  B)  C)  D) 

98. Which of the following will give the value M/e = 91?

A) Cyclopentadiene cation B) Tropylium cation
C) Hexadiene D) Ph-C^{+}=O

99. Which of the following IR absorption peaks help to identify phenanthrene from anthracene, naphthacene and pentacene?

A) ~ 750 cm^{-1} B) 1525 cm^{-1}
C) ~ 900 cm^{-1} D) ~ 830 cm^{-1}

100. Compound with molecular formula $C_3H_6O_2$ shows H-NMR values at δ 1.3 (singlet, 3 H) and 4.0 (singlet, 3H). Its possible structure is

A) CH_3COOCH_3 B) $HOCH_2.COCH_3$
C) CH_2=CH-$CH(OH)_2$ D) HOHC=CH-CH_2OH