A

18704 **120 MINUTES**

1. The values of the average velocity(U_a), root mean square velocity(U_r) and most probable velocity (U_m) are in the order
   A) $U_a > U_r > U_m$ B) $U_a > U_m > U_r$ C) $U_m > U_r > U_a$ D) $U_r > U_a > U_m$

2. The major product of dehydrobromination of 2-bromo-2-methylbutane using ethoxide ion will be
   A) 2-methyl-2-butene B) 2-methyl-1-butene
   C) 3-methyl-1-butene D) 3-methyl-2-butene

3. Hybridization of phosphorus in PCl_3 is
   A) sp^3 B) sp^2 C) sp^3d D) dsp^2

4. In the Maxwell velocity distribution curve, with increasing temperature, the area under the curve
   A) increases B) decreases
   C) remains the same D) increases irregularly

5. Which among the following is aromatic?
   A) Cyclopropene B) Cyclopropenyl cation
   C) Cyclopropenyl anion D) Cyclopropane

6. Among Si, S, Ge, Cl and Br the principal and azimuthal quantum numbers will be the same for the outermost electron in the pairs
   1) Si, Ge 2) S, Cl 3) Ge, Br 4) Cl, Br
   A) 1 and 2 B) 2 and 3 C) 3 and 4 D) 1 and 4

7. Number of carbon atoms present per unit cell of diamond is
   A) 2 B) 3 C) 6 D) 8

8. In a face centred cubic structure, A atoms occupy half the tetrahedral voids and B atoms occupy all the corners and face centres of the unit cell. If all the B atoms across one set of opposite faces along a C_4 axis are removed completely, the molecular formula of the compound would be
   A) A_3B_4 B) A_4B_3 C) A_2B_3 D) A_3B_2

9. The formation of a β-hydroxy ester from an aldehyde or ketone on reaction with an α-bromoester in the presence of zinc metal followed by hydrolysis is one example of a
   A) Cannizzaro reaction B) Reformatsky reaction
   C) Hofmann reaction D) Perkin reaction

10. The correct arrangement of IF_3, XeF_2 and SF_4 in the increasing order of lone pairs on the central atom is

A) $SF_4 > XeF_2 > IF_3$ B) $IF_3 > XeF_2 > SF_4$
C) $IF_3 > SF_4 > XeF_2$ D) $XeF_2 > IF_3 > SF_4$

11. Which of the following are correct statements?

1. The presence of Schottky defect raises the density of the crystal
2. Frenkel defect arises in crystals in which the radius ratio r_+/r_- is low.
3. Crystals with metal excess defects are generally coloured
4. Semi conduction due to the presence of impurities is called intrinsic conduction.

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

12. Borane, $B_{10}H_{14}$ is

A) closo B) nido C) arachno D) hypho

13. Which of the following is a correct equation?

A) $\left(\frac{\partial T}{\partial P}\right)_H = -\left(\frac{\partial H}{\partial P}\right)_T \Big/ C_P$ B) $\left(\frac{\partial T}{\partial P}\right)_H = \left(\frac{\partial H}{\partial P}\right)_T \Big/ C_P$

C) $\left(\frac{\partial T}{\partial P}\right)_H = C_P / \left(\frac{\partial H}{\partial P}\right)_T$ D) $\left(\frac{\partial T}{\partial P}\right)_H = -C_P \Big/ \left(\frac{\partial H}{\partial P}\right)_T$

14. One of the reasons for the high efficacy of drug nano particles is

A) their small surface-to-volume ratio B) their large surface-to-volume ratio
C) their amorphous state D) their crystalline state

15. The thermodynamic equation of state is applicable

A) only to ideal gases B) only to gases
C) only to gases and liquids D) to substances in any physical state

16. The advantage of quantum dots over organic dyes for labeling biological cells, tissues etc., is mainly due to

A) their high photo stability and sensitivity
B) their less toxic nature and low cost
C) their high thermal stability and low photosensitivity
D) their poor radio opacity and low chemical activity.

17. Maximum number of phases that can coexist at equilibrium in a three component system is

A) 5 B) 6 C) 4 D) 3

18. The major product in the following reaction is:

$CH_3CH_2O^-Na^+ + CH_3CH_2Br \xrightarrow{C_2H_5OH/55°C}$

A) $CH_2=CH_2$ B) CH_3CH_2OH
C) $CH_3CH_2OCH_2CH_3$ D) $CH_3CH_2CH_2CH_3$

19. The complex ion which exhibits optical activity is

A) $[Co(en)(NH_3)_4]^{3+}$ B) $[Rh(NH_3)_3(py)_3]^{3+}$
C) $[Cr(OX)_3]^{3-}$ D) $[Pt(NH_3)_2Cl_2]$

20. Match the following items in list 1 with those in list 2 and identify the correct matching from the choices given below.

List 1	List 2
1. $\left(\frac{\partial P}{\partial T}\right)_V = \left(\frac{\partial S}{\partial V}\right)_T$	a) Clapeyron equation
2. $\left(\frac{\partial (A/T)}{\partial T}\right)_V = -\frac{U}{T^2}$	b) Maxwell relation
3. $\frac{dP}{dT} = \frac{\Delta H}{T\Delta V}$	c) Reaction isochore
4. $\frac{d \ln K_P}{dT} = \frac{\Delta H^0}{RT^2}$	d) Gibbs' Helmholtz equation

A) 1-b, 2-d,3-a,4-c B) 1-b,2-c,3-a,4-d

C) 1-d, 2-a, 3-b,4-c D) 1-c,2-d,3-a,4-b

21. The first step in the Edman method for N-terminal amino acid determination in proteins involves

A) The reaction of protein with anhydrous hydrazine

B) The reaction of protein with C_6H_5NCS in the presence of dilute alkali

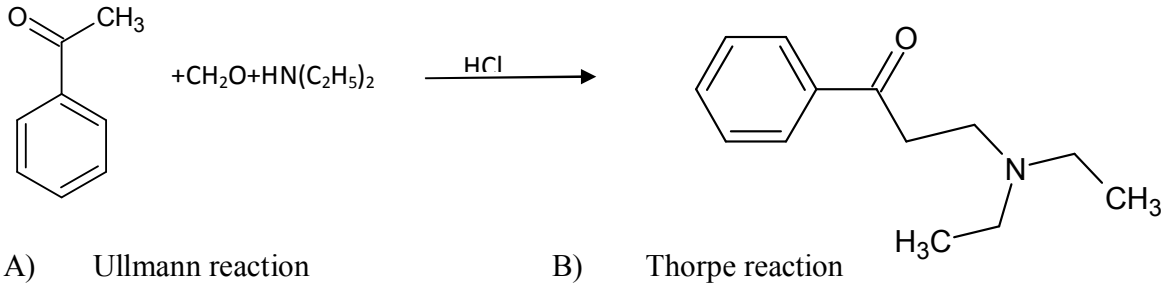
C) The reaction of protein with $LiAlH_4$

D) The reaction of protein with 1-fluoro-2, 4-dinitrobenzene.

22. Which of the following complex ions has the highest CFSE?

A) $[NiCl_4]^{2-}$ B) $[Mn(H_2O)_6]^{2+}$ C) $[Co(NH_3)_6]^{3+}$ D) $[CoBr_4]^{2-}$

23. The reaction given below is one example of



A) Ullmann reaction B) Thorpe reaction

C) Reimer-Tiemann reaction D) Mannich reaction

24. Total number of Co-Co bonds present in $Co_4(CO)_{12}$ is

A) 6 B) 8 C) 2 D) 4

25. Match the following items in list 1 with those in list 2 and identify the correct matching.

List 1	List 2
1. Alkali hydrolysis of an ester	a) Pseudo first order
2. Acid hydrolysis of an ester	b) Second order
3. Photochemical reaction of H_2 and Cl_2 over water surface	c) First order
4. Thermal decomposition N_2O_5	d) Zero order

A) 1-b, 2-c, 3-d, 4-a B) 1-b, 2-d, 3-a, 4-c
C) 1-b, 2-a, 3-d, 4-c D) 1-c, 2-a, 3-d, 4-b

26. Starch on hydrolysis with acids produces a quantitative yield of D-glucose. Enzymatic hydrolysis data suggest that
A) All glucose units are joined by C_1-C_4 α-links
B) All glucose units are joined by C_1-C_4 β-links
C) All glucose units are joined by alternate C_1-C_6 α- and β-links
D) All glucose units are joined by C_1-C_6 α-links

27. Match the complex ions in list 1 with spin only magnetic moments given in list 2 and identify the correct match.

List 1	List 2
a) $[Fe(CN)_6]^{3-}$	1) 3.87 BM
b) $[Cr(NH_3)_6]^{3+}$	2) 1.73 BM
c) $[CoF_6]^{3-}$	3) 5.92 BM
d) $[Ni(H_2O)_6]^{2+}$	4) 4.87 BM
	5) 2.83 BM

A) a-3, b-1, c-4, d-5 B) a-2, b-1, c-4, d-5
C) a-2, b-1, c-3, d-4 D) a-3, b-5, c-1, d-2

28. A first order reaction takes 50 minutes to complete 90% of the reaction. Time taken to complete 99.99% of the reaction is
A) 65 minutes B) 100 minutes C) 150 minutes D) 200 minutes

29. The common bases in DNA are
A) purine bases adenine, thymine and pyrimidine bases guanine, cytosine
B) purine bases thymine, uracil and pyrimidine bases guanine,cytosine
C) purine bases cytosine, uracil and pyramidine bases adenine and guanine
D) purine bases adenine, guanine and pyrimidine bases thymine and cytosine

30. Select the wrong statement:
A) Log β value of $[Ni(en)_3]^{2+}$ is much greater than that of $[Ni(NH_3)_6]^{2+}$
B) Alkaline hydrolysis of $[Co(py)_5Cl]^{2+}$ with OH^- does not occur by D-CB mechanism
C) Electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$ consists of a single broad band with low intensity.
D) Observed magnetic moments of octahedral Co(II) complexes are nearly equal to spin only values.

31. If the reaction mechanism consists of these elementary processes,

i. $A = 2\,B$ (fast, equilibrium)

ii. $B + 2\,C \rightarrow E$ (slow)

iii. $E \rightarrow F$ (fast)

Choose the correct differential rate law for the reaction

$$A + 4\,C \rightarrow 2\,F$$

A) $(1/2)(d[F]/dt) = k[A]\,[C]^4$ B) $\text{rate} = k[A]\,[C]^2$

C) $(d[F]/dt) = k[A]^{(1/2)}[C]^2$ D) $-d[A]/dt = k[A]^{(1/2)}\,[C]$

32. Match the items in column A with appropriate ones in column B and identify the correct match from the choices given below.

Column A	**Column B**
a) Camphor	1. Occurs in nature and is optically active
b) Papaverine	2. Contains a cyclobutane ring
c) α-Pinene	3. Used as an antimalarial
d) Quinine	4. Does not contain any chiral centre

A) a-1,b-4,c-2,d-3 B) a-2.b-1,c-3,d-4

C) a-1, b-2,c-4,d-3 D) a-4,b-3,c-2,d-1

33. Free radicals can easily be detected by

A) NMR spectroscopy B) IR spectroscopy

C) UV spectroscopy D) ESR spectroscopy

34. Nephelauxetic effect is related to

A) abnormal magnetic properties

B) Jahn-Teller distortion

C) Covalent interaction between metal and ligand

D) splitting of d-orbitals

35. Which of the following is not a characteristic of chemisorptions?

A) Enthalpy of adsorption is relatively high.

B) Adsorption cannot occur at high temperature

C) Adsorption leads to a monolayer

D) Adsorption is irreversible

36. Match the items in column A with appropriate ones in column B and identify the correct match.

Column A	Column B
a) The sol-gel process for low temperature ceramic formation	1. Self assembly
b) The vapour deposition technique	2. A controlled hydrolysis of tetraethyl silicate in aqueous alcohol
c) 'Top- down' synthesis method	3. Vapourization of metals using plasmas or high energy beam
d) 'Bottom-up' synthesis method	4. Conversion of silane to films of amorphous semiconductor silicon

A) a-4, b-3, c-2, d-1 B) a-2, b-3, c-1, d-4
C) a-2, b-4, c-3, d-1 D) a-1, b-2, c-4, d-3

37. The magnitude of the response to an agonist in the presence of an antagonist will depend on the relative affinities of the receptor for the antagonist and the agonist. The concentration at which an antagonist (drug) exerts half its maximum effect is known as its
A) LD_{50} B) PH_{50} C) IC_{50} D) IG_{50}

38. In the titration of oxalic acid against potassium permanganate, the reaction is slow at the beginning. As the titration proceeds, the reaction speeds up. Which of the following is the reason for this observation?
A) The reaction is exothermic and the enthalpy of the initial reaction provides activation energy for further reaction
B) The potassium ion introduced into the solution catalyses the reaction
C) The manganese ion introduced into the solution catalyses the reaction
D) The carbon dioxide formed in the reaction catalyses the reaction.

39. Drugs are classified in different ways. Match the items in column A with appropriate ones in column B and identify the correct match.

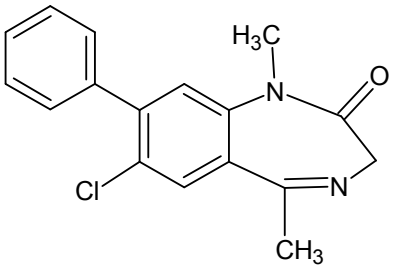
Column A	**Column B**
a) Based on chemical structure	1. Diuretics
b) Based on pharmacological action	2. Peptides
c) Based on physiological classification	3. Levodo pa
d) Prodrugs	4. Psychotropic drugs

A) a-2, b-3, c-1, d-4 B) a-1, b-2, c-3, d-4
C) a-2, b-1, c-3, d-4 D) a-2, b-1, c-4, d-3

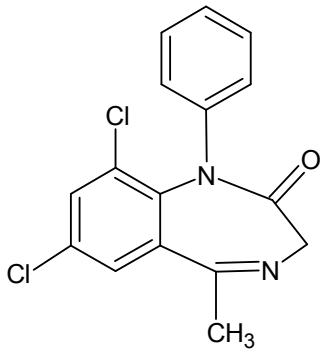
40. A cermet is a composite material composed of
A) cement and metallic materials B) carbon fibre and a metal matrix
C) ceramic and metallic materials D) ceramic and a carbon fibre matrix

41. The correct structure of diazepam is

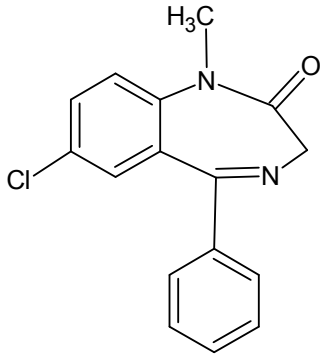
A)



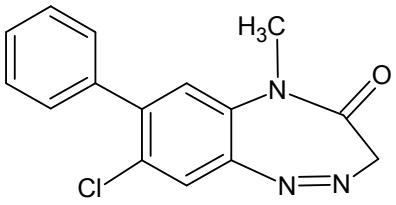
B)



C)



D)



42. The property measured in derivative thermo gravimetric analysis is

A) change in weight B) heat evolved or absorbed
C) change in temperature D) rate of change of weight

43. The percentage purity of a sample of copper sulphate can be determined by

A) Iodometry B) Polarography
C) Electrogravimetry D) All of these

44. In neutron activation analysis, the atom is identified by
A) decay characteristics of daughter element
B) the velocity of neutron
C) threshold energy of reaction
D) nuclear recoil

45. In biological systems, the metal ions involved in transmission of nerve impulse are
A) Mg^{2}+,Ca^{2+} B) Fe^{2+}, Cu^{2+} C) K^{+}, Na^{+} D) Zn^{2+},Mg^{2+}

46. Which of the following statement is incorrect?
A) BOD is defined as the amount of dissolved oxygen required by bacteria while oxidizing organic matter under aerobic conditions.
B) The sample for BOD determination is usually incubated for five days.
C) COD is a measure of the chemically oxidizable and biologically inert matter.
D) BOD is the concentration of dissolved oxygen in a specified volume of the sample.

47. The metal ion present in vitamin B-12 is
A) Zinc B) Calcium C) Iron D) Cobalt

48. Carboxyl peptidase contains
A) Zn (II) and hydrolyses CO_2 B) Zn (II) and hydrolyses peptide bonds
C) Mg (II) and hydrolyses CO_2 D) Mg (II) and hydrolyses peptide bonds

49. Oxidation state of iron in met-haemoglobin is
A) 3 B) 2 C) 4 D) zero

50. A part of the C_{3V} character table is given below along with a reducible representation, Γ. Identify the correct reduced form of Γ.

C_{3V}	E	$2C_3$	$3\sigma_v$
A_1	1	1	1
A_2	1	1	-1
E	2	-1	0
Γ	7	1	-1

A) $\Gamma = 2A_1 + A_2 + 2E$ B) $\Gamma = 4A_1 + A_2 + E$
C) $\Gamma = 3A_1 + 2A_2 + E$ D) $\Gamma = A_1 + 2A_2 + 2E$

51. The gas commonly used in ICP-AES is
A) Argon B) Carbon dioxide
C) Hydrogen D) Nitrous oxide

52. The Mullikan's notation, for a one dimensional representation antisymmetric to the principal axis, symmetric to centre of inversion and antisymmetric to horizontal plane, is
A) $A_g^{'}$ B) $B_g^{''}$ C) $B_u^{'}$ D) $A_1^{''}$

53. Which of the following is the correct selection rule for the rotational spectrum of symmetric top molecule?

A) $\Delta J = \pm 1; \Delta K = 0$ B) $\Delta J = 0, \pm 1; \Delta K = 0$

C) $\Delta J = 0, \pm 1; \Delta K = \pm 1$ D) $\Delta J = \pm 1; \Delta K = \pm 1$

54. Fermi resonance is the resonance observed because of the interaction between

A) Two fundamental transitions

B) Two overtone transitions

C) A fundamental and an overtone transitions

D) All of these

55. Select the statement which is not correct about the lanthanides.

A) Electronic absorption spectra of lanthanide complexes consist of sharp bands

B) Magnetic moment values of lanthanide complexes calculated using the equation $g[J(J+1)]^{1/2}$ agrees with the experimental values

C) Common oxidation state of lanthanides is +3

D) Coordination number in lanthanide complexes never exceeds 8

56. Which of the following statements are true?

1. For a diatomic molecule the selection rule for pure rotational Raman spectra is $\Delta J = \pm 2$
2. In the rotational Raman spectra of symmetric top molecules, every alternate R-line will be overlapped by an S-line
3. Spherical top molecules do not give pure rotational Raman spectra.

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

57. Among the major events following light absorption by a molecule, the excited triplet state (T_1) formed may return to the ground state (S_0) by emission of a photon. This process is known as

A) Radiationless decay B) Fluorescence

C) Internal conversion D) Phosphorescence

58. In the conductance titration graph where conductance is plotted against volume of strong alkali added to strong acid, the slope of the curve

A) decreases at first and remains constant after the end point

B) decreases at first and increases after the end point

C) increases at first and decreases after the end point

D) increases at first and remains constant after the end point

59. Match the following and identify the correct answer.

	List I		**List 2**
a)	Potentiometric titration	1)	Hollow cathode lamp
b)	Atomic absorption spectroscopy	2)	Petroleum industry
c)	HPLC	3)	Air pollution
d)	Turbidimetry	4)	Redox reaction

A) a-3,b-4,c-1,d-2 B) a-2,b-3,c-4,d-1

C) a-1,b-2,c-3,d-4 D) a-4,b-1,c-2,d-3

60. The nuclear magnetic resonance peak of the H-atom attached to the second carbon atom in 2-butanol will be split to give

A) Six fine structure peaks B) 12 fine structure peaks
C) Eight fine structure peaks D) five fine structure peaks

61. Which of the following sets of quantum numbers *(n, l, m_l, m_s)* best describes the valence electron of highest energy in a ground–state gallium atom (Atomic Number, 31) ?

A) 4, 0, 0, ½ B) 4, 0, 1, ½ C) 4, 1, 1, ½ D) 4, 1, 2, ½

62. High lattice energy in an ionic compound is favoured by

A) Small ion, high charge B) Small ion, low charge
C) Large ion, low charge D) Large ion, high charge

63. Compounds of nitrogen and phosphorus are mostly

A) Ionic B) Covalent
C) polar D) All varieties are possible

64. The common features among the species CN^- , CO , NO^+ are

A) Bond order three and isoelectronic B) Bond order three and weak field ligands
C) Bond order two and π – acceptors D) Isoelectronic and weak field ligands

65. The correct order of hybridization of the central atom in the following species NH_3 $[PtCl_4]^{2-}$, $PCl_5$and BCl_3 is

A) dsp^2 , dsp^3 , sp^2 and sp^3 B) sp^3 , dsp^2 , dsp^3 , sp^2
C) dsp^2 , sp^2 , sp^3 , dsp^3 D) sp^3 ,dsp^2, sp^2 , dsp^3

66. Which of the following trivalent lanthanide ions is diamagnetic

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

67. Which one of the following is hygroscopic and explosive?

A) XeO_2F_2 B) $XeOF_4$ C) $[XeO_6]^{4-}$ D) XeO_3

68. In monomeric BH_3, let an axis definition place the molecule in the xz plane. Which atomic orbital on B is non-bonding?

A) 2s B) $2p_x$ C) $2p_y$ D) $2p_z$

69. The compound which is an exception of EAN rule is

A) $V(CO)_6$ B) $Cr(CO)_6$ C) $Fe(CO)_4(PPh_3)$ D) $Ni(PF_3)_4$

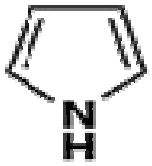
70. Which of the following reagents, when treated with phenyl magnesiuim bromide followed by acid workup, will yield 2-phenylethanol?

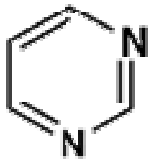
A) Ethanol B) Oxirane C) Acetaldehyde D) Ethylene

71. Myoglobin and the subunits of hemoglobin have:

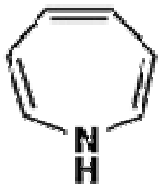
A) Very different primary and tertiary structures
B) Very similar primary and tertiary structures
C) Very similar primary structures, but different tertiary structures
D) Very similar tertiary structures, but different primary structures

72. Which of the following is **not** aromatic?

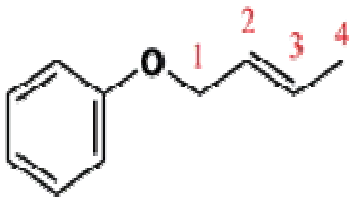
A) 

B) 

C) 

D) 

73. Which side-chain carbon makes a new bond to the benzene ring upon Claisen rearrangement of the following allylic phenyl ether?



A) C1 B) C2 C) C3 D) C4

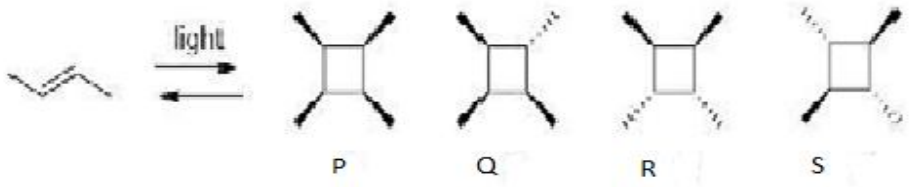
74. The reaction involved in the conversion of isoborneol to camphene is
A) Beckmann rearrangement B) Cope rearrangement
C) Wagner-Meerwein rearrangement D) Claisen rearrangement

75. The reactive intermediate in a typical Hoffmann rearrangement is a
A) Nitrene B) Benzyne C) Dienone D) Carbene

76. Which of the following is true of any (S)-enantiomer?
A) It rotates plane-polarized light to the right.
B) It rotates plane-polarized light to the left.
C) It is a racemic form.
D) It is the mirror image of the corresponding (R)-enantiomer.

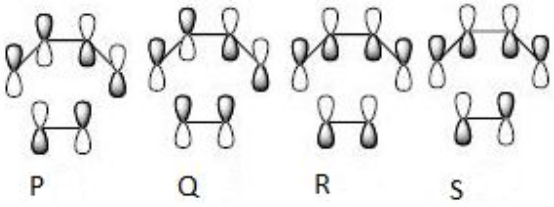
77. What can be said with certainty if a compound has $[\alpha]25/D= 9.25^0$?
A) The compound has the (S) configuration.
B) The compound has the (R) configuration.
C) The compound is not a meso form.
D) The compound possesses only one stereogenic center.

78. Photochemical reaction of *trans*-2-butene with itself will produce which of the following products?



A) P and Q B) R and S C) P and R D) Q and S

79. The Diels-Alder reaction is *not* initiated by light. Which of the following pairs of orbitals show the symmetry problem that results from photochemical excitation of the diene in the Diels-Alder reaction, thus preventing constructive orbital overlap?



A) P B) Q C) R D) S

80. Which of the following compounds can be obtained in an optically active form?
(i) Menthol (ii) Camphor (iii) Lanalool (iv) Terpinolene

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

81. What is the chemical difference between cellulose and chitin?

A) Replacement of the hydroxyl group at C2 with an acetylated amino group
B) Replacement of the hydroxyl group at C3 with an acetylated amino group
C) Replacement of the hydroxyl group at C4 with an acetylated amino group
D) Replacement of the hydroxyl group at C5 with an acetylated amino group

82. Which of the following pairs of amino acids might contribute to protein conformation by forming electrostatic interactions?

A) Glycine and leucine B) Glutamate and lysine
C) Phenylalanine and tyrosine D) Lysine and arginine

83. Which of the following statement about haemoglobin is correct?

A) 2,3-Bisphosphoglycerate (BPG) increases the affinity of haemoglobin for oxygen
B) Deoxygenated haemoglobin has a higher binding affinity for protons than has oxyhaemoglobin.
C) Haemoglobin has a higher affinity for oxygen than does myoglobin
D) One molecule of haemoglobin binds sixteen molecules of oxygen - four per subunit

84. Which one would you expect to have highest lattice energy and lowest lattice energy?
i) LiCl(s) ii) KCl(s) iii) RbCl(s) iv) CsCl(s)

A) LiCl(s) has highest lattice energy and CsCl(s) has lowest lattice energy
B) LiCl(s) has highest lattice energy and RbCl(s) has lowest lattice energy
C) LiCl(s) has lowest lattice energy and CsCl(s) has lowest lattice energy
D) CsCl(s) has highest lattice energy and RbCl(s) has lowest lattice energy

85. What is the concentration of Ag+ ion in a saturated silver chloride solution? Ksp = 1.56×10^{-10}.
A) 1.25×10^{-5} M B) 4.90 M C) 3.39×10^{-4} M D) 3.12×10^{-6} M

86. Which of the following statement 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.

87. At very high pressure the Langmuir adsorption isotherm is represented as ('x' is the mass of the gas adsorbed on 'm' g of the adsorbent, 'a' and 'b' are constants, 'p' is the pressure)
A) x/m = b/a B) x/m = 1/ap C) x/m = ap D) x/m = a/b

88. Which of the following expression gives the relation between energy (E) and partition function (Q)?
A) $E = (K_BT^2/Q) \times (\delta Q/\delta T)_{NV}$ B) $E = (K_BT/Q^2) \times (\delta Q^2/\delta T)_{NV}$
C) $E = (K_BT^2/Q) \times (\delta Q^2/\delta T)_{NV}$ D) $E = (K_BT^2/Q) \times (\delta Q^2/\delta T)_{NV}$

89. Which of the following detectors give concentration-dependent signals?
A) Infra-red detector B) Electron-capture detector
C) Thermal conductivity D) All of these

90. Choose the correct statement
A) The esr spectrum of naphthalene radical anion consists of 25 lines
B) The molecule which is IR inactive but Raman active is SO_2
C) The trans isomers posses more IR bands than the corresponding cis isomers
D) The microwave spectra are not observed in the gaseous state of atoms and molecules

91. In a DNA double – helix, quinine and cytosine bases are paired together by
A) Covalent bonds B) Hydrogen bonds
C) Peptide bonds D) Hyper conjugation

92. In the following solutions which will have the highest ionic strength (Assume complete dissociation)

A) 0.050 M $AlCl_3$ B) 0.100M NaCl

C) 0.050 M $CaCl_2$ D) 0.100 M HCl

93. Which of the following statement 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

94. If uncertainty in position and momentum are equal, then uncertainty in velocity is

A) $1/2m\ (h/\pi)^{1/2}$ B) $1/m\ (h/4\pi)^{1/2}$ C) $1/2m\ (h/4\pi)^{1/2}$ D) $1/m\ (h/2\pi)^{1/2}$

95. If two operations commute, then

A) They are Hermitian B) They are linear

C) They have the same eigen functions D) They have the same eigen values

96. 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

97. Term symbol for F_2^+ ions is

A) ${}^1\sum_g^+$ B) ${}^2\sum_u^+$ C) ${}^2\pi_u$ D) ${}^2\pi_g$

98. Use Hückel theory to determine the energies of the π orbitals of the allyl radical system, C_3H_4.

A) $\alpha + \beta, \alpha, \alpha-\beta$ B) $\alpha + 2\beta, \alpha, \alpha-2\beta$

C) α, α, α D) $\alpha + \sqrt{2}\,\beta, \alpha, \alpha-\sqrt{2}\,\beta$

99. $C_2O_4^{2-}$ is an example of a molecule belonging to the……point group.

A) D_2d B) C_2h C) D_3h D) D_2h

100. The character table of the D_{3h} point group can be constructed as the direct product of those of ---- and ----.

A) S_3 and C_{3v} B) C_s and C_{2v} C) C_s and C_{3v} D) D_{2d} and C_{3v}

101. Column efficiency is measured in terms of number of plates which is

A) Inversely related to the square of the peak width

B) Directly related to the square of the peak width

C) Inversely related to the cube root of the peak width

D) Directly related to the cube of the peak width

102. For a typical adsorbent such as silica gel, the most popular pore diameters are

A) 10 and 50 Å B) 60 and 100 Å
C) 100 and 150 Å D) 150 and 200 Å

103. Which is the correct order of increasing wave number of the stretching vibrations of (1) C-H (alkane), (2) C-H (alkene), (3) C-H (alkyne), and (4) C-H (arene)?

A) (1) < (2) ≈ (3) < (4) B) (4) < (3) ≈ (2) < (1)
C) (3) < (4) ≈ (2) < (1) D) (1) < (4) ≈ (2) < (3)

104. How many signals does the unsaturated ketone $(CH_3)_2CHCH_2C(O)CH=CH_2$ have in ^1H NMR and ^{13}C NMR spectra?

A) Five ^1H signals and six ^{13}C signals
B) Six ^1H signals and six ^{13}C signals
C) Six ^1H signals and seven ^{13}C signals
D) Five ^1H signals and seven ^{13}C signals

105. Which of the following partition functions has highest magnitude?

A) translational B) rotational C) vibrational D) electronic

106. Which of the following compounds contains a square planar metal centre?

A) $Ni(CO)_4$ B) $Ir(CO)Cl(PPh_3)_2$
C) $Ni(\eta^3\text{-}C_3H_5)_2$ D) $Cr(NO)_4$

107. Which of the following is useful for determination of volatilities of plasticizers and other additives?

A) Thermo gravimetric analysis B) Differential scanning calorimetry
C) Scanning electron microscopy D) Atomic force microscopy

108. The tensile strength of an MWNT is ------- Pa.

A) 63×10^6 B) 63×10^7 C) 63×10^8 D) 63×10^9

109. Nano particles of which atom are used to control collateral damage due to explosion?

A) Copper B) Aluminium C) Carbon D) Lead

110. Which type of material expand and contract in response to an applied electric field?

A) Advanced material B) Smart material
C) Biomaterial D) Nanomaterial

111. Which one of the following is non-linear material?

A) Zirconium oxide B) Magnetite
C) Maghemite D) Lithium niobate

112. Effect of gaseous pollutants depends mainly on their

A) hydrophobic in nature B) ability to settle down
C) solubility in water D) longevity in air

113. Which of the following is a branched chain polymer?

A) HDPE B) LDPE
C) isotactic polypropylene D) amylose(starch)

114. The study of fracture surfaces of polymeric material is done using

A) Atomic force microscopy B) X-ray diffraction
C) Thermo gravimetric analysis D) Scanning electron microscopy

115. Which of the following polymer has ester linkage?

A) Nylon 66 B) PVC C) Terylene D) SBR

116. The inverse operation of S_3 operation is

A) S_3^2 B) S_3^3 C) S_3^4 D) S_3^5

117. Which of the following pairs of receptors are likely to show the greatest structural similarity?

A) The dopamine receptor subtypes D_3 and D_5
B) The M_2 muscarinic receptor and the β_2-adrenergic receptor
C) The H_2 histamine receptor and the α_1-adrenoceptor
D) The H_1 histamine receptor and the β_2 adrenoceptor

118. Which of the following statement is true?

A) The most stable conformation of a drug is also the active conformation
B) The active conformation is the most reactive conformation of a structure
C) The active conformation is the conformation adopted by a drug when it binds to its target binding site.
D) The active conformation can be determined by conformational analysis

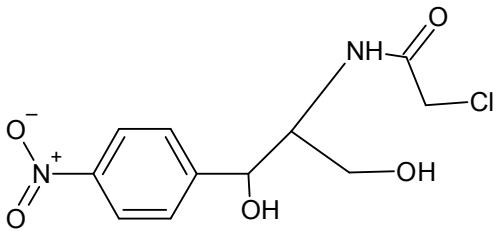
119. Match the following items in column A with appropriate ones in column B and identify the correct match.

Column A	**Column B**
a) Nylon-6	1) Trans-poly(2-chloro-1,3-butadiene)
b) Neoprene	2) An aramide
c) Kevlar	3) Caprolactam
d) Natural rubber	4) cis-poly(2-methyl-1,3-butadiene)

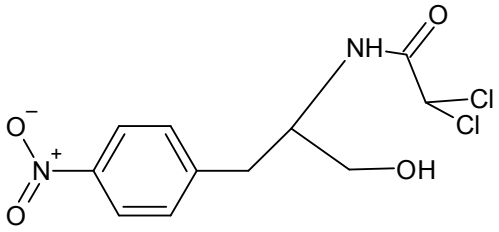
A) a-1,b-3,c-2,d-4 B) a-3,b-1,c-2,d-4
C) a-2,b-3,c-4,d-1 D) a-3,b-2,c-4,d-1

120. The structure of chloramphenicol is

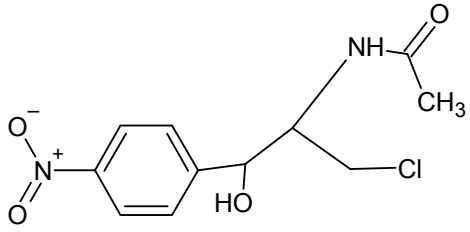
A)



B)



C)



D)