A

19204 **120 MINUTES**

1. Which of the following observations of photoelectric effect could not be explained using classical mechanics?
   I. The proportionality of the intensity of photoelectric current to the intensity of radiation.
   II. Existence of a threshold frequency characteristic of the metal
   III. The variation of stopping potential of photoelectrons linearly with the frequency of the radiation
   IV. The absence of a time lag between the fall of radiation on the metal surface and the ejection of electrons

   A) I, II and III only B) I, II and IV only
   C) II, III and IV only D) I, III and IV only

2. The pair of species having linear geometry is:
   A) SO_2 and CO_2 B) NO_2^+ and IF_2^-
   C) NO_2^- and XeF_2 D) $SnCl_2$ and $BeCl_2$

3. In Compton effect, the Compton wavelength is the $\Delta\lambda$ corresponding to the scattering angle θ equal to
   A) 90° B) 60° C) 45° D) 180°

4. Electron gain enthalpy is positive for
   A) Nitrogen B) Lithium C) Neon D) Fluorine

5. Which of the following statement is true?
   A) An aromatic compound is less stable than an analogous cyclic compound
   B) An antiaromatic compound is less stable than an analogous cyclic compound
   C) An antiaromatic compound is more stable than an analogous aromatic compound
   D) An antiaromatic compound must be a planar cyclic compound with an interrupted ring of p-orbital bearing atoms and the π cloud must contain an odd number of pairs of π electrons.

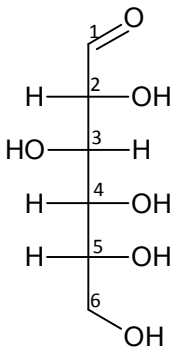
6. The term symbols possible for a p^4 configuration according to the Pauli's exclusion principle are $^1D_2$, $^3P_2$, $^3P_1$, $^3P_0$ and $^1S_0$. The correct order of their increasing energy is:

   A) $^3P_0 < {}^3P_1 < {}^3P_2 < {}^1D_2 < {}^1S_0$ B) $^1D_2 < {}^3P_0 < {}^3P_1 < {}^3P_2 < {}^1S_0$
   C) $^1D_2 < {}^3P_2 < {}^3P_1 < {}^3P_0 < {}^1S_0$ D) $^3P_2 < {}^3P_1 < {}^3P_0 < {}^1D_2 < {}^1S_0$

7. For NO, NO^+ and NO^-, the correct stability order is
   A) $NO^+ < NO < NO^-$ B) $NO < NO^+ < NO^-$
   C) $NO^- < NO < NO^+$ D) $NO < NO^- < NO^+$

8. The p-orbital character is maximum in the covalent bonds of
   A) H_2S B) H_2O C) NH_3 D) PCl_3

9. Using the following Fischer projection formula of D(+) glucose the R and S designations of the chiral centres can be assigned as



A) 2R, 3S, 4R, 5R B) 2S, 3R, 4S, 5R
C) 2R, 3R, 4S, 5S D) 2S, 3S, 4R, 5S

10. Which of the following observations is NOT true with regard to the structure of quinine?
A) Quinine contains an ethoxy group
B) Quinine contains a methoxy group
C) Quinine contains one ethylenic double bond
D) Quinine contains a secondary alcoholic group

11. The ground state term symbol for O_2 molecule is
A) ${}^3\Sigma_u^-$ B) ${}^3\Sigma_u^+$ C) ${}^3\Sigma_g^+$ D) ${}^3\Sigma_g^-$

12. Match the items in List I with those in List II and chose the correct matching from the choices given below.

	List I		List II
1.	Thiamine	a.	Its deficiency causes scurvy in man
2.	Riboflavine	b.	Its deficiency causes pellagra in man
3.	Niacin	c.	Its deficiency causes beriberi in man
4.	Ascorbic acid	d.	Water soluble, shows a green fluorescence

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

13. Which of the following are correct statements?
I. The bond order of CO molecule is 2 according to molecular orbital theory
II. In H_2^+, the exchange integral contributes more to the stability of the species than the coulomb integral
III. The valence bond theory predicts equal contribution of covalent and ionic character in H_2 molecule.

A) I and II B) I and III C) II and III D) I, II and III

14. Which of the following is a wrong statement?
A) Copper(I) undergoes disproportionation in aqueous medium
B) Manganese (II) is a stronger reducing agent than chromium(II)
C) Oxygen is superior to fluorine in stabilizing higher oxidation states of a transition metal
D) Oxoanions are stable for vanadium

15. Fill in the blanks and choose the correct answer from the choices given below.
I. The primary structure of DNA is --------- in the nucleotide strands
II. The secondary structure of DNA is -------- of twisted strands
III. The -------- back bone is on the outside and the bases are on the inside of the double helix
IV. -------- between base pairs is just one of the forces holding the two strands of the DNA double helix together.

A) I-the sequence of bases, II-a double helix, III- sugar phosphate, IV-hydrogen bonding
B) I-the sugar phosphate link, II-a double helix, III- the hydrogen bonded, IV- the Van der Waals' force
C) I- the double helix, II- the sequence of bases, III- the sugar phosphate, IV-the gravitational force
D) I- the double helix, II- the sugar phosphate link, III- the nucleotide, IV- hydrogen bonding

16. List I contains certain species and List II contains the type of interaction present in each of them. Match them appropriately and select the correct matching from the choices given below.

List I		List II
1. H_3O^+	a)	Hydrogen bonding
2. HCl	b)	ion-induced dipole
3. I_3^-	c)	ion-dipole
4. $Ar(H_2O)_n$	d)	dipole-induced dipole
	e)	dipole-dipole

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

17. Cl_2O_7 is the anhydride of
A) Hypochlorous acid B) Chlorous acid
C) Chloric acid D) Perchloric acid

18. Experimental evidences show that cellobiose unit is present in cellulose. This indicates that
A) glucose units are present in the furanose form and so they are linked by C_1-C_5 linkages
B) glucose units are present in the pyranose form and so they are linked by C_1-C_4 linkages
C) glucose units are joined by α – links
D) glucose units are linked by C_1-C_6 linkages.

19. If centre of symmetry *i* is removed from the D_{3d} point group, the new group formed would be:
A) D_{3h} B) C_{3h} C) D_3 D) C_{3V}

20. Oleum is

A) H_2SO_5 B) $H_2S_2O_6$ C) $H_2S_2O_7$ D) $H_2S_2O_8$

21. Some metals are given in List I and their ores in List II. Match them and identify the correct matching from the choices given.

List I		List II
1. Manganese	a.	Malachite
2. Copper	b.	Galena
3. Zinc	c.	Pyrolusite
4. Lead	d.	Calamine
	e.	Cryolite

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

22. Which of the following compounds can easily undergo anionic polymerisation?

A) Propylene B) Isobutylene C) Acrylonitrile D) Vinyl acetate

23. Which of the following are Abelian Groups?

I. C_{2V} II. D_3 III. C_{3V} IV. C_3

A) I, II and III B) II, III and IV C) I, II and IV D) I, III and IV

24. Silicates with layer structure can be represented as

A) $(SiO_3)_n^{2n-}$ B) $(Si_4O_{11})_n^{6n-}$ C) $(Si_2O_5)_n^{2n-}$ D) $(Si_2O_7)^{6-}$

25. The overall order of reactivity of esters, amides, acid anhydrides and acyl chlorides towards nucleophilic substitution is

A) $RCOCl > (RCO)_2O > RCOOR' > RCONH_2$
B) $(RCO)_2O > RCOOR' > RCOCl > RCONH_2$
C) $RCONH_2 > RCOCl > (RCO)_2O > RCOOR'$
D) $RCOOR' > RCONH_2 > RCOCl > (RCO)_2O$

26. In peptide bond synthesis, N-protection and C-activation are carried out using specific reagents. The C-activation is usually done by

A) di-tert.butyl dicarbonate B) dicyclohexyl carbodiimide
C) cyclohexyl carbamide D) phenyl isothiocyanate

27. The difference in CFSE between octahedral and tetrahedral complexes is maximum for:

A) Co(II) B) Ni(II) C) Mn(II) D) Fe(II)

28. Predict the products of the reaction,

Methyl propanoate $\xrightarrow[(ii)\ H^+,\ H_2O]{(i)LiAlH_4}$

A) $CH_3CH_2CH_2COOH + CH_3OH$
B) $CH_3CH_2CH_2OH + CH_3CH_2CH_2COOH$
C) $CH_3CH_2CH_2OH + CH_3OH$
D) $CH_3CH_2COOH + CH_3CH_2OH$

29. The asymmetry of the rotation vibration spectrum of a diatomic molecule is due to
A) difference in the spacing of the vibration levels of an anharmonic oscillator
B) difference of selection rule for an anharmonic oscillator from that of a harmonic oscillator
C) change in the shape of the potential energy curve for an anharmonic oscillator
D) change in the rotational constant with change in vibrational quantum number

30. The number of chelate rings present in $[Fe(dien)_2]^{2+}$ is
A) 2 B) 3 C) 4 D) 6

31. Which of the following methods is NOT used to evaluate the degree of crystallinity of a polymer?
A) Differential Scanning Calorimetry (DSC)
B) X-ray Diffraction (XRD)
C) Nuclear Magnetic Resonance (NMR)
D) Ultraviolet spectroscopy (UV spectroscopy)

32. Which of the following statement is true with respect to the three vibrational modes of H_2O molecule?
A) All the three are parallel vibrations.
B) All the three are perpendicular vibrations.
C) Two of them are parallel vibrations and one is perpendicular vibration.
D) Two of them are perpendicular vibrations and one is parallel vibration.

33. Formulae of certain complexes are given in List I and their spin only magnetic moments are given in List II. Match them and identify the correct matching from the choices given below.

	List I	List II
1.	$[Co(NH_3)_6]^{3+}$	a. 3.87
2.	$[Mn(H_2O)_6]^{2+}$	b. 1.73
3.	$[Cr(NH_3)_6]^{3+}$	c. 4.89
4.	$[Fe(CN)_6]^{3-}$	d. 5.92
		e. Zero

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

34. In the transition moment integral, $I\alpha \int_{-\infty}^{+\infty} \Psi_i^* \hat{P} \Psi_f d\tau$, for Raman spectrum the transition moment operator $\hat{P}$ is

A) permanent dipole moment
B) induced dipole moment
C) change in dipole moment during vibration
D) either permanent dipole moment or induced dipole moment

35. The species which can combine with the fragment $Fe(CO)_3$ to form a stable compound is:
A) η^4-butadiene B) η^5-C_5H_5 C) η^2-ethylene D) η^3-allyl

36. At BOD levels of 6-9 ppm, the water is considered as
A) very good for drinking B) moderately clean
C) very polluted D) somewhat polluted

37. The electron spin resonance spectrum peaks are very broad and this is due to
A) Very efficient spin-spin relaxation
B) Doppler effect
C) Collision broadening
D) Less efficient spin-lattice relaxation

38. The stretching frequency of CO is observed at 2143 cm^{-1}. The possible values for corresponding frequencies in $Cr(CO)_6$ and $[V(CO)_6]^-$ are respectively
A) 1860 cm^{-1} and 2000 cm^{-1} B) 2000 cm^{-1} and 1860 cm^{-1}
C) 2265 cm^{-1} and 2185 cm^{-1} D) 2185 cm^{-1} and 2265 cm^{-1}

39. Some of the important physicochemical factors affecting drug absorption are:
A) route of administration, transport process, membrane physiology
B) disintegration time, dissolution time, storage condition
C) drug solubility and dissolution rate, particle size and effective surface area, polymorphism and amorphism
D) lipid solubility, drug stability, pH of the environment

40. Iron nucleus has a spin of ½ in the ground state and ³⁄₂ in the excited state. The number of peaks produced in the Mossbauer spectrum of $[Fe(CN)_5NO]^{2-}$ in presence of an external magnetic field is
A) 4 B) 5 C) 6 D) 7

41. Which of the following metals undergoes water exchange reactions very slowly?
A) Cr(III) B) Co(II) C) Ni(II) D) V(III)

42. Which of the following statement does not hold good for quantum dots?
A) Quantum dots are semiconductors that are on the manometer scale
B) Quantum dots do not show quantum confinement effects
C) Quantum dots exhibit energy band gap that determines required wavelength of radiation absorption and emission
D) Quantum dots can be optically excited

43. The electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$ exhibits a maximum at 20000 cm^{-1}. CFSE of the complex ion is
A) 20000 cm^{-1} B) 10000 cm^{-1} C) 4000 cm^{-1} D) 8000 cm^{-1}

44. Composite materials are usually classified on the basis of
A) matrix material and material structure
B) polymer material and metallic material
C) chemical structure and chemical properties
D) material nature and material type

45. The appearance of a prominent peak at M/z =91 in the mass spectrum of a compound indicates the presence of

A) C_6H_5NH group B) $C_6H_5CH_2$ group
C) C_6H_3O group D) C_6H_4NH group

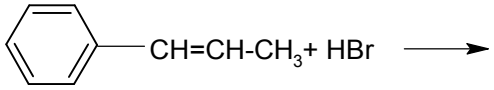
46. The reaction,

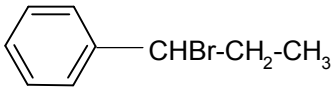
$$[(CO)_5\,MnCH_3] + CO \longrightarrow [(CO)_5\,Mn\text{-}COCH_3]$$

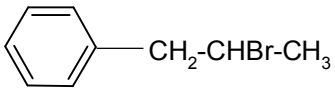
is an example of

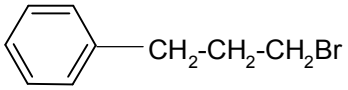
A) nucleophilic addition B) electrophilic addition
C) oxidative addition D) migratory insertion

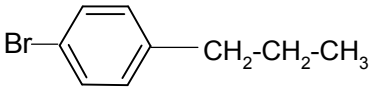
47. Which is the major product of the following reaction?



A) 

B) 

C) 

D) 

48. The unit cell dimensions $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$ are those of

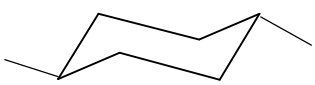
A) orthorhombic system B) tetragonal system
C) monoclinic system D) trigonal system

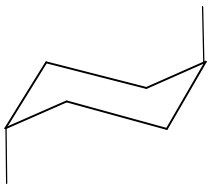
49. Only terminal CO groups are present in

A) $Os_2(CO)_9$ B) $Fe_3(CO)_{12}$ C) $Ir_4(CO)_{12}$ D) $Co_4(CO)_{12}$

50. The stable chain conformation of trans- 1, 4-dimethylcyclohexane can be represented as:

A) 

B) 

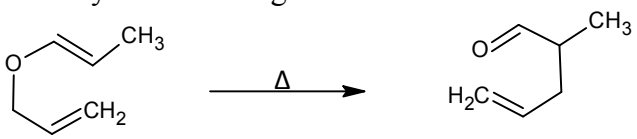
C) 

D) Both B and C

51. The numbers of octahedral and tetrahedral voids associated with a face centred cubic unit cell are respectively

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

52. Identify the following reaction:



A) Cope rearrangement
B) Claisen rearrangement
C) Wagner-Meerwin rearrangement
D) Fries rearrangement

53. Helium gas undergoes effusion four times as fast as an organic gas. The molecular mass of the organic gas is

A) 16 B) 64 C) 32 D) 48

54. Identify the correct statements about lanthanide (III) ions.

I. Their coordination numbers can be greater than 8
II. Their complexes rarely exhibit isomerism
III. Their metal-ligand bond is predominantly covalent
IV. Their electronic absorption spectra consist of sharp bands

A) I, III and IV B) I and IV C) II and III D) I, II and IV

55. The product obtained when anisole is subjected to Birch reduction is

A) 1-methoxy-1, 4-cyclohexadiene
B) 1-hydroxy-1, 4-cyclohexadiene
C) 6-methoxy-1, 4-cyclohexadiene
D) 6-hydroxy-1, 4-cyclohexadiene

56. The mean free path in a gas is

A) directly proportional to both temperature and pressure
B) inversely proportional to both temperature and pressure
C) directly proportional to temperature and inversely proportional to pressure
D) directly proportional to pressure and inversely proportional to temperature

57. The pair of lanthanides having the highest third ionization enthalpy is:

A) Eu, Gd B) Dy, Yb C) Lu, Yb D) Eu, Yb

58. The osmotic pressure of a 0.1M $Al_2(SO_4)_3$ solution is 8.96 atmosphere whereas that of a 0.1M urea solution is 2.24 atmosphere at 273 K. The degree of dissociation of aluminium sulphate in this concentration is

A) 50% B) 60% C) 75% D) 80%

59. Match the metal ions given in List I with the reagents used for their quantitative precipitation of them given in List II and identify the correct matching from the choices given below.

List I	List II
1. Nickel (II)	a. 8-Hydroxy quinoline
2. Zinc (II)	b. Ammonium thiocyanate
3. Calcium (II)	c. Ammonium molybdate
4. Copper (I)	d. Dimethyl glyoxime
	e. Ammonium oxalate

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

60. Diazepam and ketamine are classified respectively as
A) new psychoactive substance and cannabis
B) depressant and new psychoactive substance
C) cannabis and depressant
D) hallucinogen and opioid

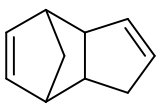
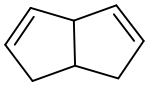
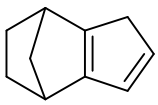
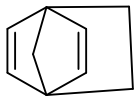
61. A particular reaction has ΔH=-100 kJ mol^{-1} and ΔS=-100 J mol^{-1} K^{-1}. Which of the following statement is true for the reaction?
A) The reaction attains equilibrium at 1000K and is spontaneous below 1000K
B) The reaction attains equilibrium at 1000K and is spontaneous above 1000K.
C) The reaction is always spontaneous
D) The reaction is never spontaneous.

62. Which of the following compounds can be used as primary standards in volumetric analysis?
I. $K_2Cr_2O_7$ II. $KMnO_4$ III. NaOH IV. $Na_2B_4O_7.10H_2O$
V. $CuSO_4.5H_2O$ VI. $Na_2S_2O_3.5H_2O$

A) I, IV and V B) I, II, V and VI
C) II, III and VI D) II, V and VI

63. Differential thermal analysis is a technique in which
A) a change in the weight of a substance is recorded as a function of temperature
B) the temperature difference between a substance and a reference material is measured as a function of temperature
C) the difference in energy inputs into a substance and a reference material is measured as a function of temperature
D) changes in dimensions of a substance are measured as a function of temperature.

64. Cyclopentadiene, on standing at room temperature, slowly undergoes a Diels-Alder reaction with itself. The product of the reaction would be

A)  B)  C)  D) 

65. Phosphorus pentachloride dissociates on heating into phosphorus trichloride and chlorine. One mole of PCl_5 is heated to a particular temperature and allowed to attain equilibrium. The equilibrium constant of the mixture is ⅓ atmosphere when the equilibrium pressure of the mixture is 1 atmosphere. What is the partial pressure of chlorine in the mixture?

A) ⅓ atm. B) ⅔ atm. C) ⅙ atm. D) 1 atm.

66. The false statement for a polarographic measurement procedure is:

A) Oxygen is removed
B) Dropping mercury electrode is the working electrode
C) I_d is proportional to concentration of electroactive species
D) Residual current is made zero by adding supporting electrolyte.

67. Complexes formed by lanthanides with dipivaloylmethane (dpmH) can be separated by

A) gel permeation chromatography
B) gas chromatography
C) gel filtration chromatography
D) ion exchange chromatography

68. Which of the following are correct statements?

I. In steady state approximation, it is assumed that no reaction occurs at the steady state.
II. According to the Lindemann mechanism, a unimolecular gaseous reaction is first order at high pressures.
III. In the H_2-Br_2 reaction, the rate of reaction is hindered by the product formed.
IV. The presence of NO inhibits chain reactions.

A) I, II and III B) I, III and IV C) I, II and IV D) II, III and IV

69. In potentiometric titrations the end point can be located by plotting

A) volume of titrant against electro motive force readings with reference electrode
B) first derivative curve (volume against $\Delta E/\Delta V$)
C) second derivative curve (volume against $\Delta^2 E/\Delta V^2$)
D) all the above

70. The migratory aptitudes of the groups,
I. p-chlorophenyl II. Phenyl III. p-tolyl IV. p-anisyl
in pinacol rearrangement are in the order

A) I < II < III < IV B) IV < II < III < I
C) II < III < IV < I D) III < IV < I < II

71. The Arrhenius frequency factor A is related to the entropy of activation as per the equation (k_B is the Boltzmann constant)

A) $A = \frac{hT}{k_B} e^{\Delta S^*/R}$ B) $A = \frac{h}{k_B T} e^{\Delta S^*/R}$ C) $A = \frac{k_B T}{h} e^{\Delta S^*/R}$ D) $A = \frac{k_B T}{h} e^{-\Delta S^*/R}$

72. Both geometrical and optical isomerism are exhibited by

A) $[Rh(NH_3)_3Cl_3]$ B) $[Rh(en)_2Cl_2]^+$

C) $[Co(NH_3)_4Cl_2]^+$ D) $[Co(en)_3]^{3+}$

73. Which of following methods the can be used to study the kinetics of fast reactions?

I. Flash photolysis II. Flow techniques

III. Relaxation methods IV. Isolation method

A) I, II and III B) I, II and IV C) I, III and IV D) II,III and IV

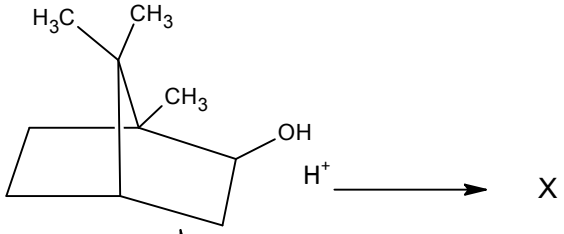
74. The ionic strength of a 0.1M aluminium sulphate solution is

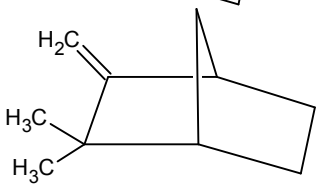
A) 0.5 B) 1.0 C) 1.5 D) 2.0

75. In an experiment the densities of lithium metal are found to be 0.54, 0.55, 0.52 and 0.51 g cm^{-3}. The mean deviation and standard deviation are respectively

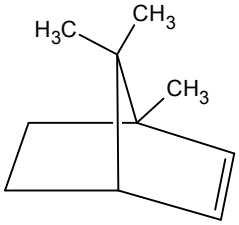
A) 0.015, 0.115 B) 0.015, 0.018 C) 0.15, 0.018 D) 0.51, 0.218

76. Give the structure of the product, X of the following reaction and name the rearrangement involved.

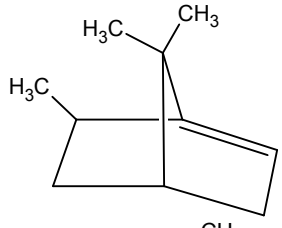


A) 

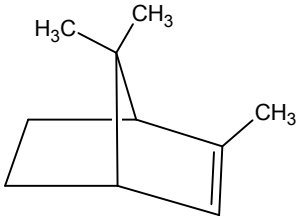
Wagner-Meerwin rearrangement

B) 

Cope rearrangement

C) 

Favorskii rearrangement

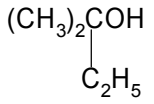
D) 

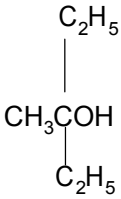
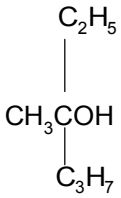
di-pi methane rearrangement

77. If the same quantity of electricity is passed through solutions of NaCl, $MgCl_2$ and $AlCl_3$, the number of moles of the compounds decomposed will be in the ratio

A) 1: 2: 3 B) 3: 2: 1 C) 2: 3: 6 D) 6: 3: 2

78. Which of the following tertiary alcohols cannot be prepared from the reaction of an ester with excess of Grignard reagent?

A) $(CH_3)_3COH$ B) 

C)  D) 

79. Liquid junction potential depends on

I. transport number of the ions
II. mean ionic activities of the solutions
III. EMF of the cell without transference
IV. temperature of measurement

A) I, II and III B) I, II and IV C) I, III and IV D) II, III and IV

80. The balanced equation for the total reaction at the anode of the methane-oxygen fuel cell with KOH as the electrolyte is

A) $CH_4 + 4OH^- \rightarrow C + 4H_2O + 4e^-$

B) $CH_4 + 8OH^- \rightarrow CO_2 + 6H_2O + 8e^-$

C) $CH_4 + 6OH^- \rightarrow CO + 5H_2O + 6e^-$

D) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

81. Identify the following statements as true (T) or false (F) and choose the correct answer from the choices given below.

I. Cholesterol consists of a nucleus which is composed of four rings with two methyl groups- one at C-10 and the other at C-13 and a side chain.
II. Cholesterol shows the presence of two double bonds and one keto-group
III. Cholesterol is a tetra cyclic compound with a secondary alcoholic group
IV. Cholesterol shows the presence of one double bond and a primary alcoholic group

A) I-T, II-T, III-F, IV-T B) I-T, II-F, III-T, IV-F
C) I-F,II-T, III-F, IV-T D) I-F, II-F, III-T, IV-F

82. Adsorption of a gas on a solid surface is associated with

I. a decrease of free energy II. a decrease of entropy III. a decrease of enthalpy

Which of these are correct?

A) I and II B) I and III C) II and III D) I, II and III

83. The metal ions involved in blood clotting and transmission of nerve signals are respectively

A) sodium and potassium B) calcium and potassium
C) manganese and sodium D) calcium and zinc

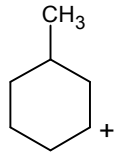
84. Statement I : MnO_4^- is coloured but the heavier analogue ReO_4^- is colourless.
Statement II: Energy required for charge transfer from oxygen to manganese is greater than that required for oxygen to rhenium

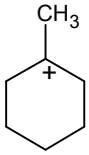
A) Statements I and II are correct and II is the correct explanation of I
B) Statements I and II are correct and II is not the correct explanation of I
C) Statement I is true and statement II is not true
D) Both the statements are false

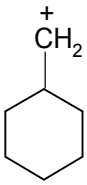
85. Statement I : LiF and CsI are insoluble in water
Statement II: Lattice enthalpy of LiF is very high while the hydration enthalpy of CsI is very low.

A) Statements I and II are correct and II is the correct explanation of I
B) Statements I and II are correct and II is not the correct explanation of I
C) Statement I is true and statement II is not true
D) Both the statements are false

86. Which of the following carbocations would you expect to rearrange?

A) 

B) 

C) 

D) $CH_3CH_2\overset{+}{C}HCH_3$

87. The degree of hydration ----- down the group from Lithium ion to Cesium ion.

A) Increases B) Decreases
C) Remains the same D) None of the above

88. The size of iso-electronic species decreases with increase in their

A) Coordination number B) Molecular weight
C) Atomic weight D) Atomic number

89. The correct statement about ionisation energy (IE) is

A) IE decreases down the group in the periodic table.
B) Non metallic character of an element decreases as the IE increases
C) IE decreases on moving from left to right in the periodic table
D) Second IE of Calcium is larger than the second IE of potassium.

90. The most abundant noble gas in atmosphere is -----.

A) He B) Ne C) Ar D) Kr

91 Which of the following is a high spin d^6 complex?

A) $[Fe(CN)_6]^{3-}$ B) $[Co(H_2O)_6]^{3+}$ C) $[CoF_6]^{2-}$ D) All the above

92. Which of the following is a non-heme protein?

A) Cytochrome C B) Hemerythrin

C) Myoglobin D) None of the above

93. Identify the false statement.

A) OsO_4 is commonly known as osmic acid

B) OsO_4 is most often used for anti-hydroxylation of alkenes.

C) OsO_4 is a regioselective reagent.

D) OsO_4 reagent always attacks on the less hindered side of the olefinic bond.

94. Identify the correct statements

a) Cis- decalin is more stable than trans- decalin

b) Trans -decalin is more stable than cis- decalin

c) Trans -decalin isomers undergoes ring-flip

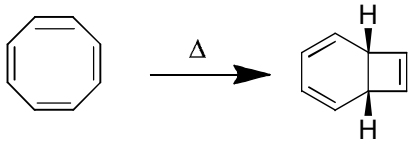
d) Cis -decalin isomers undergoes ring-flip

A) a & c B) b & d C) a & d D) b & c

95. The number of nodes present in the HOMO of 1, 3, 5-hexatriene in its ground state is

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

96. Number of π electrons and the mode involved in the following pericyclic reaction is



A) 6 and disrotatory B) 4 and disrotatory

C) 6 and conrotatory D) 4 and conrotatory

97. Gilman reagent is ----

A) Lithium di-isopropylamide B) N-Bromosuccinimide

C) Lithium diorganocuprates D) None of these

98. Which of the following has the maximum resonance energy?

A) Furan B) Pyrrole C) Thiophene D) Furfural

99. RMS velocity of gas molecules is ------.

A) Equal to average velocity

B) Always less than average velocity

C) Always greater than the average velocity

D) None of these

100. Copper crystallises in a face-centred cubic lattice with a unit cell length of 361 pm. What is the radius of copper atom in pm?
A) 108 pm B) 127 pm C) 216 pm D) 254 pm

101. Which of the following gases is most easily liquefied?
A) Hydrogen B) Nitrogen C) Oxygen D) Chlorine

102. Which of the following statement is correct?
A) Order is always equal to molecularity of the reaction.
B) The rate constant of a reaction decreases with time.
C) The half life period of a first order reaction is independent of the initial concentration of reactants.
D) The units of second-order rate constant is mol dm^{-3} s^{-1}.

103. Specific conductance of 0.01 N solution of an electrolyte is 0.00419 mho/cm. The equivalent conductance of this solution (in*mho* cm^2 $equiv^{-1}$) will be ----
A) 419 B) 4.19 C) 0.419 D) 0.00419

104. Two elements of the periodic table does not show ESCA chemical shifts. They are----
A) Hydrogen and Helium B) Uranium and thorium
C) Lithium and Sodium D) Argon and Krypton

105. If we take ClF_3 molecule as stereochemically rigid and if we assume that Cl is not NMR active, then its ^{19}F NMR spectrum would be -----.
A) A singlet B) Two singlets
C) A doublet and a triplet D) A doublet and a singlet

106. The total number of vibrational degrees of freedom available for toluene molecule is ----.
A) 18 B) 20 C) 39 D) 40

107. For Manganese, I= 5/2. Then, the total number of fine and hyperfine EPR lines expected for high spin octahedral Mn(II) complexes are-----.
A) 4 and 24 B) 3 and 30 C) 5 and 33 D) 5 and 30

108. The proton decoupled ^{13}C NMR spectrum of cyanobenzene will have ----number of signals.
A) 3 B) 4 C) 5 D) 6

109. The fact that the fluorescence wavelength is often much longer than the irradiation wavelength (Stokes shift) is a consequence of which phenomenon?
A) High Inter System Crossing rates (El Sayed rule)
B) Franck–Condon principle
C) Low extinction coefficients (Lambert-Beer law)
D) Kasha's rule

110. Which of the following bonds would be having the highest stretching frequency?
A) C-C bond B) C=C bond C) C≡C bond D) C-Br bond

111. Chromatogram is a graph obtained by plotting ------ against time.
A) Quantity B) Concentration
C) Density D) Specific gravity

112. If N is the plate number, 'W_b' is the width at the base of the peak which is equal to 4 standard deviations and 't_R' is the adjusted retention time
A) $N = 16\ t_R^2/W_b$ B) $N = 4\ t_R^2/W_b$

C) $N = (4t_R/W_b)^2$ D) $N = 4\ (t_R/W_b)^2$

113. ------ can be used for detecting amino acids in protein hydrolyzates after introducing the reagent dansylchloride in the sample.
A) Thermal conductivity detectors
B) Fluorescence detectors
C) Refractive index detectors
D) Electrochemical detectors

114. In polarographic cell containing KCl, when potential is applied, oxygen is reduced at ----.
A) Anode B) Cathode
C) Both the electrodes D) Electrolyte

115. Which of the thermal procedures is non-destructive in nature?
A) DTA B) TGA
C) DSC D) None of the above

116. Amoxicillin is a member of ----- family.
A) Streptomycin B) Chloramphenicol
C) Penicillin D) Tetracycline

117. ----- is not a green house gas.
A) Nitrogen B) Carbon dioxide
C) Methane D) Water vapour

118. Which of the following tranquilizers is a derivative of barbituric acid?
A) Seconal B) Veronal C) Luminal D) All the above

119. ------ is a raw material used in the manufacture of most common polycarbonates
A) Bisphenol-A B) Carbonyl chloride
C) Both A and B D) None of these

120. ------ is a component of dettol .
A) Salbutamol B) Chloroethanol
C) Bithional D) Terpineol
