A

17204 **120 MINUTES**

1. The second ionization enthalpies of the 13th group elements follow the order
   A) B > Al > Ga > In > Tl B) B > Ga > Tl > In > Al
   C) B > Al > Ga > Tl > In D) B > Ga > Tl > Al > In

2. The carborane $C_2B_4H_6$ has the structure
   A) Closo – tetrahedron B) Nido – trigonalbipyramid
   C) Closo – octahedron D) Arachno - icosahedron

3. Which among the following statement is correct regarding the structures of CF_4, SF_4 and XeF_4?
   A) Structures are same with 0, 2 and 1 lone pairs of electrons respectively
   B) Structures are different with 0, 1 and 2 lone pairs of electrons respectively
   C) Structures are same with 0, 1 and 2 lone pairs of electrons respectively
   D) Structures are different with 0, 2 and 1 lone pairs of electrons respectively

4. Which among the following is thermochromic?
   A) S_4N_4 B) SiC C) Al_2Se_3 D) $XeOF_4$

5. Three most abundant transition metals on earth crust are
   A) Fe, Co & Ti B) Cr, Mn & Ag C) Fe, Ti & Mn D) V, Mn & Cu

6. Tungsten bronzes used in the production of metallic paints are non stoichiometric M_xWO_3. Where M is
   A) Na or K B) An alkaline earth metal
   C) A lanthanide D) All the above

7. Which among the following lanthanide ions show spin only magnetic moment?
   A) Ce^{4+}, Gd^{3+}, Lu^{3+} B) Gd^{3+}, Pm^{3+}, Er^{3+}
   C) Ce^{3+}, Pm^{3+}, Er^{3+} D) Eu^{3+} Gd^{3+}, Lu^{4+}

8. The acidity of oxides of Mn follows the order
   A) $MnO < MnO_2 < Mn_2O_3 < Mn_2O_7$
   B) $MnO < MnO_2 < Mn_2O_7 < Mn_2O_3$
   C) $Mn_2O_7 < MnO_2 < Mn_2O_3 < MnO$
   D) $MnO < Mn_2O_3 < MnO_2 < Mn_2O_7$

9. Which among the following complexes show both linkage isomerism and stereo isomerism?
   (i) $[Pt\ (Cl_2)\ (NH_3)_4]\ Br_2$ (ii) $[Pt(NH_3)_4][PtCl_4]$
   (iii) $[Co\ Cl(en)_2NO_2]\ Br$ (iv) $[Co(NH_3)_5SCN]\ Cl_2$

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

10. Which of the following complexes show M $\longrightarrow$ L charge transfer?
A) $[Co(CO)_6]$ B) $KMnO_4$
C) $[Co(NH_3)_6]^{3+}$ D) $[Ni(H_2O)_6]^{2+}$

11. The ground term symbols of V^{3+} and Co^{2+} ions are respectively
A) ${}^3F_4,\ {}^4F_{3/2}$ B) ${}^3F_2,\ {}^4F_{7/2}$ C) ${}^4F_{3/2},\ {}^3F_4$ D) ${}^3D_2,\ {}^4F_{7/2}$

12. In the reaction of $[Co(NCS)(NH_3)_5]^{2+}$ with $[Cr(H_2O)_6]^{2+}$ in water as solvent, the final chromium based product/s
A) is exclusively $[Cr(NCS)(H_2O)_5]^{2+}$
B) contain $[Cr(SCN)(H_2O)_5]^{2+}$ as major component and $[Cr(NCS)(H_2O)_5]^{2+}$ as minor component
C) is exclusively $[Cr(SCN)(H_2O)_5]^{2+}$
D) contain $[Cr(NCS)(H_2O)_5]^{2+}$ as major component and $[Cr(SCN)(H_2O)_5]^{2+}$ as minor component

13. Which among the following complexes obey the 18 electron rule?
(i) $IrCl_2(CH_3)(CO)(PPh_3)$, (ii) $Cr(\eta^6\text{–}C_6H_6)_2$, (iii) $V(CO)_6$, (iv) $Mn_2(CO)_{10}$

A) i, ii & iv only B) i, iii & iv only
C) i & iii only D) ii & iv only

14. The three trinuclear carbonyls known are, $Fe_3(CO)_{12}$, $Os_3(CO)_{12}$ and $Ru_3(CO)_{12}$. Choose the correct statement regarding their structures.
A) All are iso-structural.
B) $Os_3(CO)_{12}$ and $Ru_3(CO)_{12}$ are iso-structural and $Fe_3(CO)_{12}$ has a different structure.
C) $Fe_3(CO)_{12}$ and $Os_3(CO)_{12}$ are iso-structural and $Ru_3(CO)_{12}$ has a different structure.
D) $Fe_3(CO)_{12}$ and $Ru_3(CO)_{12}$ are iso-structural and $Os_3(CO)_{12}$ has a different structure.

15. Which among the following is a fluxional organometallic compound?
A) $Mn(\eta^5\text{–}C_5H_5)_2$ B) $Fe_2(CO)_9$
C) $Co_4(CO)_{12}$ D) $PdCl_2(cod)$

16. The catalyst used in Monsanto acetic acid process is
A) $RhH(CO)(PPh_3)_3$ B) $[Rh(CO)_2I_2]^-$
C) $RhCl(PPh_3)_3$ D) $[Rh(CO)_4I_3]$

17. Which of the following metal ions facilitate the folding of protein chains?
A) K^+ B) Na^+ C) Ca^{2+} D) Fe^{2+}

18. The oxygen carrier in which when O_2 molecule attaches Fe(II) is oxidised to Fe(III)
A) Myoglobin B) Hemerithrin
C) Haemoglobin D) Hemocyanin

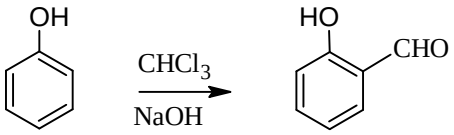
19. Which of the following are, respectively, iron storage and transport proteins?

A) Rubredoxin and ferrodoxin B) Ferritin and transferrin
C) Myoglobin and hemoglobin D) Hemocyanin and hemerythrin

20. The number of ATP reducing units used by nature to convert one N_2 molecule to ammonia is

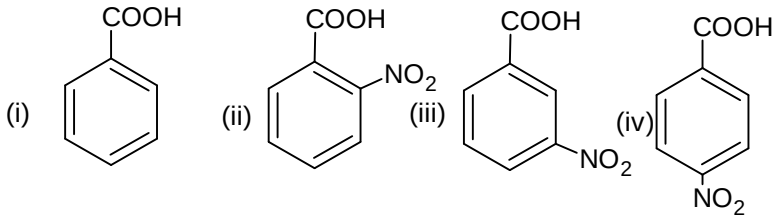
A) 12 B) 10 C) 8 D) 16

21. The intermediate formed in the following reaction is a



A) carbocation B) carbanion
C) free radical D) carbene

22. Arrange the following in the increasing order of acidity.

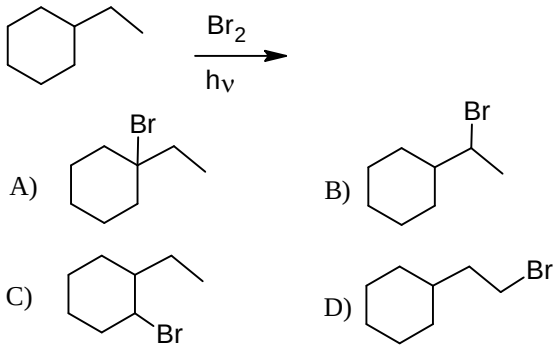


A) (i) < (ii) < (iv) < (iii) B) (i) < (iv) < (iii) < (ii)
C) (i) < (iii) < (iv) < (ii) D) (iii) < (ii) < (iv) < (i)

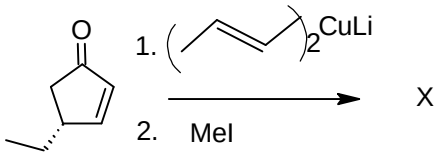
23. Which of the following statements is wrong?

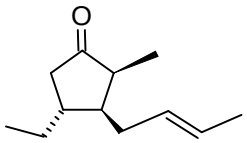
A) Benzene, a [6] annulene is aromatic
B) Cyclobutadiene, a [4] annulene is antiaromatic
C) Cyclooctatetraene, an [8] annulene is nonaromatic
D) Cyclodecapentaene, a [10] annulene is aromatic

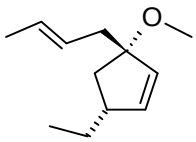
24. The major product of the following reaction is

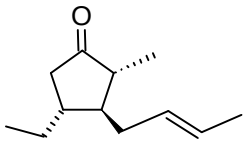


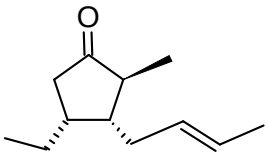
25. The major product X formed in the following reaction is



A) 

B) 

C) 

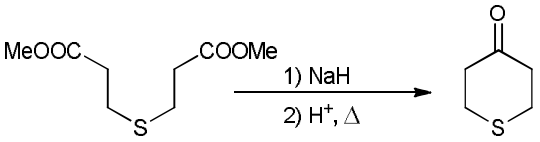
D) 

26. The effective transformation of acetophenone to ethylbenzene can be effected by

(i)	Clemenson reduction	(ii)	Rosenmonds reduction
(iii)	Wolf – Kishner reduction	(iv)	$LiAlH_4$

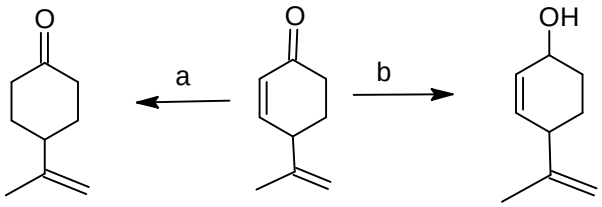
A)	(i) and (ii) only	B)	(i) and (iii) only
C)	(i) and (iv) only	D)	All the four

27. The following reaction is an application of –



A)	Mannich reaction	B)	Thorpe reaction
C)	Dieckmann condensation	D)	Aldol condensation

28. The correct reagents required for the following transformations are

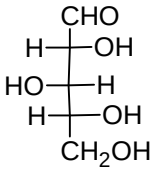


A) 'a' is $LiAlH_4$ at room temperature and 'b' is $NaBH_4$
B) 'a' is $LiAlH_4$ at -78^{o}Cand 'b' is $NaBH_4$
C) 'a' is Li in liq.NH_3 and 'b' is $NaBH_4/CeCl_3$
D) 'a' is DIBALH and 'b' is $NaBH_4$

29. The number of optical isomers and meso forms possible for the compound $CH_3(CHBr)_5CH_3$ are:

A) 12 optical isomers and 4 meso forms
B) 16 optical isomers and 4 meso forms
C) 32 optical isomers without meso forms
D) 13 optical isomers and 3 meso forms

30. The absolute configurations of the following compound D-(+) Xylose is



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

31. The most suitable reagent for the resolution of a racemic 2-butanol is

A) acetone B) citric acid
C) optically pure (+) lactic acid D) optically pure mannitol

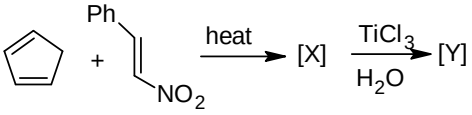
32. Which of the following is not true?

A) Boat conformation is the preferred conformation of 1, 4-cyclohexanediol
B) *cis*-1, 3-dimethylcyclohexane is a *meso* compound
C) In *cis*-1, 3-cyclohexanediol, the diaxial is the preferred conformation
D) In 2-bromocyclohexanone, the bromine is at equatorial position

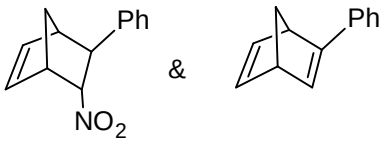
33. Benzophenone is used as a sensitizer for 1,3-butadiene to form 1,2-divinylcyclobutane because –

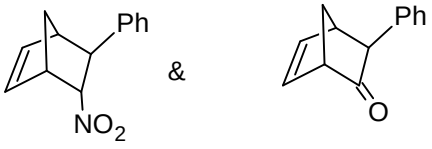
A) The triplet energy of 1,3-butadiene is greater than that of benzophenone
B) The triplet energy of benzophenone is greater than that of 1,3-butadiene
C) The singlet energy of benzophenone is much higher than that of 1,3-butadiene
D) The singlet energy of 1,3-butadiene and benzophenone are almost equal

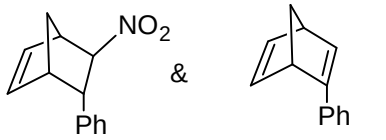
34. In the reaction sequence

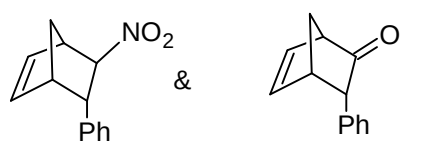


The major products X and Y are

A) 

B) 

C) 

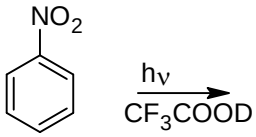
D) 

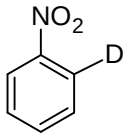
35. Match the following:

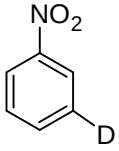
1.	Terpene	a	Protein
2.	Edman method	b	Camphor
3.	Multibranched polysaccharide of glucose	c	Cellulose
4.	Linear chain of β-linked glucose	d	Glycogen

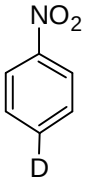
A) 1-b, 2-c, 3-a, 4-d B) 1-b, 2-a, 3-d, 4-c
C) 1-a, 2-b, 3-c, 4-d D) 1-b, 2-a, 3-c, 4-d

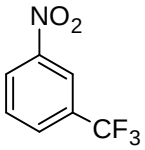
36. The major product of the following photochemical reaction is

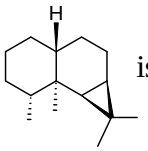


A) 

B) 

C) 

D) 

37. The compound 

is an example of a

A) Monoterpenoid B) Diterpenoid
C) Sesquiterpenoid D) Triterpenoid

38. Which of the following compounds has/have a β-glycosidic linkage?
(I) sucrose (II) starch (III) cellulose (IV) glycogen

A) Only I & II B) Only I,II & III
C) Only I, II & IV D) III only

39. A vitamin which is a metal complex is
A) Vitamin A B) Vitamin B_{12} C) Vitamin C D) Vitamin K

40. Which among the following lipids are not esters of fatty acids?
(i) Bee wax (ii) vegetable oils (iii) cholesterol (iv) prostaglandin (v) fat

A) i, ii, v only B) i, iii, iv only C) ii, iv only D) iii, iv only

41. The miller indices of a plane which cuts the three crystallographic axes at 1/2a,-1/3b and 1/3c is
A) $2\bar{3}3$ B) 233 C) $\bar{2}3\bar{3}$ D) $\bar{2}\bar{3}\bar{3}$

42. The number of C-atoms in one unit cell of diamond is

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

43. Given below are two statements:

Statement I: Crystal structure of KCl as determined by X-ray diffraction studies appears to be primitive cubic unit cell even though it is fcc.

Statement II: X-ray cannot distinguish between K^+ and Cl^- ions due to isoelectronic species

Identify the correct choice from the following

A) Statement I is correct and statement II is the correct explanation of statement I
B) Statement I is correct and statement II is not the correct explanation of statement I
C) Statement I is correct and statement II is incorrect
D) Statement I is incorrect and statement II is incorrect

44. Which among the following statements is/ are correct regarding the mean free path of a gas molecule?

I. Mean free path of a gas is proportional to the absolute temperature
II. Mean free path of a gas is inversely proportional to pressure
III. Mean free path of a gas is inversely proportional to the square of its molecular diameter

A) I & II only B) I & III only C) II & III only D) I, II & III

45. What is the change in Gibbs free energy during isothermal reversible expansion of 1 mole of ideal gas from a pressure of 10 atm to a pressure of 1 atm at a temperature of 25 ^oC? ($R = 8.3\ JK^{-1}mol^{-1}$)

A) -5.7kJ B) 5.7kJ C) -57 kJ D) 57 kJ

46. The entropy change of the transformation of 1mol of water at 0 ^oC into ice at the same temperature is (latent heat of fusion of ice = 333.6 J/g)

A) 22 $Jmol^{-1}$ B) $-22\ Jmol^{-1}$ C) $1.2\ Jmol^{-1}$ D) $-1.2\ Jmol^{-1}$

47. In any spontaneous process taking place at constant temperature and pressure and tending towards equilibrium

A) G (free energy) decreases continuously
B) G increases continuously
C) G decreases, ultimately attaining a minimum value
D) G increases, ultimately attaining a maximum value

48. If θ_{rot} is the rotational characteristic temperature, rotational partition function for a homonuclear diatomic molecule is ------

A) $1/\theta_{rot}$ B) $T/2\theta_{rot}$ C) $2T/\theta_{rot}$ D) $8T/\theta_{rot}$

49. For the reaction X + Y → Z; starting with different initial concentration of X and Y, initial rate of reaction were determined graphically in four experiments as shown in the following table. The rate law for the reaction from the data in the table is

Sl. No.	$[X]_o$ / M (Initial conc.)	$[Y]_o$ / M (Initial conc.)	Rate M s^{-1}
1	1.6×10^{-3}	5×10^{-2}	10^{-3}
2	3.2×10^{-3}	5×10^{-2}	4×10^{-3}
3	1.6×10^{-3}	10^{-1}	2×10^{-3}
4	3.2×10^{-3}	10^{-1}	8×10^{-3}

A) $r = k[X]^2 [Y]^2$ B) $r = k[X]^2 [Y]$ C) $r = k[X] [Y]^2$ D) $r = k[X] [Y]$

50. Given below are two statements
Statement I: The rate constant of a reaction increases with temperature.
Statement II: The increase in rate constant is mainly due to increase in bimolecular collisions.
Identify the correct choice from the following
A) Statement I is correct and statement II is the correct explanation of statement I
B) Statement I is correct and statement II is not the correct explanation of statement I
C) Statement I is correct and statement II is incorrect
D) Statement I is incorrect and statement II is incorrect

51. For a chemical reaction obeying Arrhenius equation which one of the following plots will be linear (k – rate constant)
A) k versus T B) log$k$ versus T
C) log$k$ versus logT D) log$k$ versus 1/T

52. Primary kinetic salt effect on ionic reaction is best explained by
(I) Collision Theory (II) Absolute reaction rate Theory (III) Debye –Huckel Theory

A) II & III only B) I only C) II only D) I & III only

53. The mean ionic activity coefficient for the electrolyte $M_{\nu_+} X_{\nu_-}$ is related to its ionic strength by ($\gamma_\pm$ is the mean ionic activity coefficient, $z_+ \& z_-$ are the charges of cations and anions respectively, I the ionic strength)
A) $\log \gamma_\pm = 5.09 z_+ z_- \sqrt{I}$ B) $\log \gamma_\pm = -5.09 z_+ z_- \sqrt{I}$
C) $\log \gamma_\pm = -0.509 z_+ z_- \sqrt{I}$ D) $\log \gamma_\pm = 0.509 z_+ z_- \sqrt{I}$

54. Which among the following is a cell without liquid junction?
A) $Cu|Cu^{2+}|Zn^{2+}|Zn$
B) $Ag|AgCl_{(s)}|HCl(0.1M)|HCl(0.05M)|AgCl_{(s)}|Ag$
C) $Pt|H_2(1atm)|HCl(a_1)|AgCl|Ag|AgCl||HCl(a_1)|H_2(1atm)|Pt$
D) Both B & C

55. Which among the following statements are true for overvoltage of an electrode?
(I) Overvoltage depends on the nature and physical state of the electrode
(II) Overvoltage depends on the physical state of the substance deposited
(III) Overvoltage depends on the current density employed

A) I only B) I & III only C) I & II only D) I, II & III

56. The maximum efficiency of a fuel cell is equal to
A) Electrical energy produced by one mole of fuel (ΔG)
B) $\frac{\Delta G}{\Delta H} \times 100$
C) $\frac{\Delta G}{\Delta U} \times 100$
D) –nFE

57. Multilayer adsorption is best dealt with
A) Freundlich isotherm B) Langmuir isotherm
C) BET isotherm D) Temkin Isotherm

58. The surface tension of the solvent is γ_0 and surface tension of a solution is γ then the surface pressure π is given by
A) $\gamma_0 - \gamma$ B) $\gamma_0 + \gamma$ C) γ_0 / γ D) $\gamma_0 \times \gamma$

59. Which of the following is an associated colloid?
A) Gold sol B) gel C) micelles D) aerosol

60. Match the following

Column I	Column II
(i) A catalyst and reactant in different phase	a) Negative catalysis
(ii) A catalyst and reactants in the same phase	b) Heterogeneous catalysis
(iii) A catalyst reduces the speed of the reaction	c) Autocatalysis
(iv) One of the products of the reaction acts as a catalyst	d) Homogeneous catalysis

A) i - b, ii - a, iii - d, iv - c B) i - b, ii - d, iii - a, iv - c
C) i - a, ii - c, iii - d, iv - b D) i - b, ii - d, iii - c, iv - a

61. The time dependent Schrodinger equation is
A) $\hat{H}\,\Psi = E\,\Psi$ B) $i\hbar\frac{\partial \Psi}{\partial t} = \hat{H}\,\Psi$
C) $\nabla^2\Psi + V\,\Psi = E\,\Psi$ D) $-\frac{\hbar^2}{2m}\frac{\partial^2\Psi}{\partial x^2} + V\,\Psi = E\,\Psi$

62. If the energy of a particle in a cubical box of edge length L is $\frac{3h^2}{8mL^2}$ the energy required for the excitation of the particle into the next higher energy level is

A) $\frac{3h^2}{8mL^2}$ B) $\frac{6h^2}{8mL^2}$ C) $\frac{9h^2}{8mL^2}$ D) $\frac{3h^2}{4mL^2}$

63. The number of radial and angular nodes in a 4f orbital are respectively

A) 3, 3 B) 2, 2 C) 0, 3 D) 0, 2

64. The effective nuclear charge felt by a 2p electron of a nitrogen atom is

A) 3.9 B) 6.7 C) 7.0 D) 4.2

65. The bond order of NO bond in nitric oxide is

A) 2 B) 2.5 C) 3 D) 1.5

66. Which of the following pairs are isostructural?

(I) NO_3^-, NF_3 (II) NO_3^-, BF_3
(III) NF_3, HN_3 (IV) NH_3, H_3O^+

A) I, II & IV only B) I & II only
C) I & IV only D) II & IV only

67. The ground term symbol of a O_2 molecule is

A) ${}^1\sum_g^+$ B) ${}^3\sum_g^+$ C) ${}^3\sum_g^-$ D) ${}^1\sum_g^-$

68. The type of molecular interactions in liquid nitrogen is

A) Dipole – dipole B) Dipole –induced dipole
C) Ion- dipole D) Induced dipole – induced dipole

69. Match the following molecules to their point groups.

Molecule	Point group
I) C_2H_4	a) C_s
II) $POCl_3$	b) O_h
III) SF_6	c) C_{3v}
IV) HOCl	d) D_{2h}

A) I – d, II – c, III – b, IV - a B) I – d, II – a, III – b, IV - c
C) I – c, II – d, III – b, IV - a D) I – d, II – c, III – a, IV - b

70. Which among the following point groups is both abelian and cyclic?

A) C_{2v} B) C_{3V} C) C_{2h} D) C_4

71. For CO_2 molecule

A) The asymmetric stretching is Raman inactive and IR active
B) Bending vibrations is Raman active and IR inactive
C) Symmetry stretching is Raman and IR inactive
D) Symmetry stretching and bending are both Raman and IR active

72. The product of $C_{2(x)}$ x $C_{2(y)}$ is equal to

A) E B) σ_{xy} C) i D) $C_{2(z)}$

73. Which among the following molecules show pure rotational spectrum?

I) CO_2 II) HCl III) CH_4 IV) C_6H_6 V) CH_3Cl

A) I, II & V only B) II & V only
C) II, IV & V only D) I, II, IV & V only

74. All the three branches (P, Q & R) are seen in the vibration- rotational spectra of the molecule

A) NO B) CO C) HCl D) DCl

75. Which among the following nuclei are NMR active

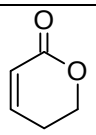
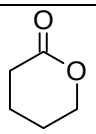
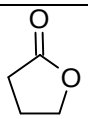
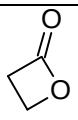
(I) ^{14}N, (II) ^{16}O, (III) ^{19}F, (IV) ^{14}C, (V) ^{31}P

A) I, II, III & V only B) II & IV only
C) I, III & V only D) All the above

76. For $^{14}N_2$ molecule the rotational constant is $2cm^{-1}$. When it is exposed to monochromatic 29697 cm^{-1} laser, the first scattered Stokes line for $^{14}N_2$ will be at

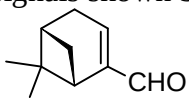
A) 29709 cm^{-1} B) 29685 cm^{-1} C) 29705 cm^{-1} D) 29689 cm^{-1}

77. Match the following carbonyl stretching frequencies with the correct compounds

Frequencies (cm^{-1})	Compound
I) 1735	a) 
II) 1820	b) 
III) 1770	c) 
IV) 1725	d) 

A) I- b, II- d, III- c, IV-a B) I- c, II- d, III- b, IV-a
C) I- b, II- c, III- d, IV-a D) I- b, II- d, III- a, IV-c

78. The number of proton NMR signals shown by the compound



is

A) 6 B) 7 C) 8 D) 9

79. In the mass spectrum of C_2H_4ClBr, the ratio of intensities of m/z 142: 144: 146 will be
A) 4:3:1 B) 2:4:1 C) 3:4:1 D) 3:3:1

80. The esr spectrum of a radical with a single magnetic nucleus is split into 6 lines. What is the spin of the nucleus?
A) 3 B) 5/2 C) 5 D) 3/2

81. Which of the following is a redox indicator?
A) Methyl orange B) Methyl red
C) Phenolphthalein D) Diphenylamine

82. The numbers 3.47, 2.43, 8.35 and 7.85 when rounded off to two significant figures are respectively as follows
A) 3.5, 2.4, 8.3 and 7.8 B) 3.5, 2.4, 8.4 and 7.9
C) 3.5, 2.4, 8.4 and 7.8 D) 3.5, 2.4, 8.3 and 7.9

83. The standard deviation of the mean is called as
A) Population standard deviation
B) Coefficient of variation
C) Relative standard deviation
D) Standard error

84. The average particle size in gravimetric analysis is increased by
A) Using concentrated reagents for precipitation
B) Using low temperature condition for precipitation
C) Primary precipitate is subjected to digestion
D) None of the above

85. Match the following:

Techniques	Type of equilibrium
(i) Liquid chromatography	a) Partition between gas and liquid
(ii) Gas chromatography	b) Partition between super critical fluid and bonded surface
(iii) Super fluid chromatography	c) Adsorption
(iv) Column chromatography	d) Partition between immiscible liquids

A) i – c, ii- a, iii- b, iv- d B) i – d, ii- a, iii- b, iv- c
C) i – d, ii- a, iii- b, iv- d D) i – b, ii- a, iii- d, iv- c

86. Which among the following are the detection methods used in GC?

I) Flame ionization detector II) Electron capture detector
III) Mass spectra IV) Thermal conductivity detector

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

87. Biomolecules that are sensitive to pH & harsh environments are best separated by
A) Ion exchange chromatography
B) Gas chromatography
C) Gel permeation chromatography
D) Electrophoresis

88. In a chromatographic analysis of lemon oil, a peak for lemon oil has a retention time of 7.6 min with a base line width of 0.95 min and γ – Terpinene elute with a retention time of 9.4 min with a baseline width of 0. 65 min. The resolution between the two peaks is

A) 2. 25 B) 1.12 C) 3.60 D) 1.80

89. When a monochromatic beam of light of wavelength 540 nm is passed through a sample solution in cell 1cm thick, if the transmittance is 0.2, what will be the overall reduction in intensity when the path length is doubled for the same monochromatic radiation?

A) 88 % B) 80 % C) 96 % D) 90 %

90. Which among the following are used as ionization suppressers to minimise ionization interferences in AAS?

(I) Ca (II) K (III) Sr (IV) Cs (V) La

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

91. Generally, AAS is used for the estimation of metal ions. However, it cannot be successfully used for the estimation of Al, Ti, W, Mo, V, Si, etc, when flame is used as a source of radiation. This is mainly due to:
A) They will not interact with the characteristic radiation in the flame.
B) They give rise to oxides in the flame.
C) Their vapors corrode the instrumental parts.
D) Detection and measurement of their absorption signals are difficult.

92. The kinetic energies of the photoelectrons are found to be 5.63eV and 4.53 eV ejected from N_2 molecules with He (I) line incident radiation (21.22 eV). The HOMO energy levels of these electrons are respectively

A) -15.59 eV, -16.69 eV B) 15.59 eV, 16.69 eV
C) -5.63 eV, - 4.53 eV D) 5.3eV, 4.63 eV

93. A solution with a pH 5 will become neutral, if its H^+ ion concentration is -----

A) decreased by 100 times B) increased by 100 times
C) increased by 1000 times D) decreased by 1000 times

94. In which of the following electrochemical analytical methods is a fixed potential employed?

A) Voltametry B) Amperometry
C) Cyclic voltametry D) Stripping Voltametry

95. In polarography the relationship between limiting current and concentration of the analytic sample is given by

A) Ohms law B) Nernst equation
C) Faraday's law D) Ilkovic equation

96. When the pH of a solution is altered by 1 unit the emf of the hydrogen electrode will

A) Increase by 59 mV B) Decrease by 59 mV
C) Increase by 0.059 mV D) Will not change

97. Phase transitions of a solid can be identified by

A) TG B) DTG C) DSC D) Both B & C

98. Match the following for a radiometric precipitation titration.

Column I	Column II
i) The titrant is labelled with its radioactive isotope	a) Radioactivity of the solution has a minimum at the equivalence point
ii) The reagent is labelled with a radioactive isotope	b) The activity of the solution decreases to the equivalence point
iii) Both reaction partners are labelled with radioactive isotopes	c) The activity of the solution increases after the equivalence point.

A) (i) – c, (ii) – a, (iii) – b B) (i) – b, (ii) – c, (iii) – a
C) (i) – b, (ii) – a, (iii) – c D) (i) – c, (ii) – b, (iii) – a

99. 3.7×10^{17} disintegrations per second is called

A) curie B) becquerel C) rad D) rem

100. Which of the following is a disadvantage of activation analysis?

A) The technique is not very sensitive.
B) The technique is not suitable in the case of Al, Mg, Ti, V and Nb.
C) As it is a destructive technique, not suitable for jewels, precious stones, etc.
D) Great accuracy cannot be attained and therefore, it is not a quantitative technique

101. Which among the following is false with respect to microwave organic synthesis?

A) Highly ordered crystalline materials are poorly absorbing.
B) Compounds with high dielectric constants, such as water, ethanol and acetonitrile, tend to heat readily.
C) Less polar substances like aromatic and aliphatic hydrocarbons or compounds with no net dipole moment do not interact under microwave irradiation.
D) Changes to the physical properties of a compound or material will not have any influence on the susceptibility to microwave radiation.

102. Nitrile hydratase enzyme from *Rhodococcus* is used to convert
A) acrylonitrile into acrylamide
B) penicillin G into 6-aminopeniillanic acid
C) lactose into glucose and galactose
D) ethanol to acetic acid

103. Which among the following cannot be regarded as a possible 'green' advantage in using Phase Transfer Catalysts (PTC)?
A) Because of reduced activation energy, these reactions can often be run only at higher temperatures, which may reduce by-product formation
B) PTC catalysed reactions are often very rapid, one reason being that anions in the organic phase have few associated water molecules, making them highly reactive through reduction in activation energy.
C) The product separation is often simple, resulting in less waste.
D) Since the reaction is two phase, simple benign solvents can often be used since PTC avoids the need to find a solvent that will dissolve all reactants

104. Atom economy is defined by

A) $100\ X\ \frac{\text{actual quantity of products achieved}}{\text{theoretical quantity of products achievable}}$

B) $100\ X\ \frac{\text{yield of desired product}}{\text{amount of substrate converted}}$

C) $100\ X\ \frac{\text{Relative molecular mass of desired product}}{\text{Relative molecular mass of all reactants}}$

D) $100\ X\ \frac{\text{amount of carbon in product}}{\text{total amount of carbon present in reactants}}$

105. The nanomaterial used in LED and fluorescent displays is
A) Si B) CdSe C) ZnS D) Li_3N

106. Which among the following are top – down fabrication of nanomaterials?
(I) Photolithography (II) e- beam lithography
(III) Vapour phase synthesis (IV) Soft lithography

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

107. The piezoelectric ceramic material which is used in gas lighters is
A) Al_2O_3 B) SiO_2
C) Cordierite D) Lead Zirconium Titanate (LZT)

108. What is the colour of gold nanoparticle in the size (~30nm)?
A) Blue B) Green C) Red D) Colourless

109. Which among the following are mainly formed in photochemical smog?
(i) NO (ii) N_2O (iii) CH_2O (iv) Acrolein (v) CH_2Cl_2 (vi) Peroxy acetyl nitrate

A) (i), (iii), (iv) & (vi) only B) (i), (ii), (iii), (iv) & (vi) only
C) (i), (ii), (v) & (vi) only D) All the above

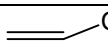
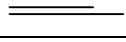
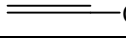
110. Stratospheric ozone depletion is mainly caused by
(i) CFC (ii) N_2 (iii) CH_4 (iv) NO

A) (i), (iii) & (iv) only B) (i), (ii) & (iii) only
C) (i), & (iv) only D) All the above

111. Acid rain is a rain when the pH of rain water is
A) > 7 B) > 5.6 C) < 5.6 D) between 7 & 5.6

112. Fertility of soil is increased by
A) Increasing alkalinity
B) Increasing the cation exchange capacity
C) Increasing acidity
D) Increasing the anion exchange capacity

113. Match the following monomers with the correct polymer.

Monomer	Polymer
(i) 	a) Orlon
(ii) $F_2C{=}CF_2$	b) polystyrene
(iii) 	c) PVC
(iv) 	d) Teflon

A) i -d, ii - a, iii- b, iv - c B) i - c, ii - d, iii - b, iv - a
C) i- b, ii - a, iii - d, iv - c D) i - d, ii - c, iii - b, iv - d

114. Super glue is a polymer of
A) methyl-α −cyanoacrylate B) Methyl acrylate
C) Caprolactam D) Phenol and formaldehyde

115. Styrene can undergo polymerisation via
A) Radical polymerisation B) Cationic polymerisation
C) Anionic polymerisation D) All the above

116. Match the following

Column I	Column II
a) Z-poly(2-methyl-1,3-butene)	(i) A polycarbonate
b) Polybutylenesuccinate	(ii) A Plasticizer
c) Dibutyl phthalate	(iii) Natural rubber
d) Laxen	(iv) A biodegradable synthetic polymer

A) a- ii, b- i, c- iv, d- iii B) a- ii, b- iii, c- iv, d- i
C) a- iii, b- i, c- iv, d- ii D) a- iii, b- iv, c- ii, d- i

117. Which among the following drugs contain a β −lactum ring?
A) Paracetamol B) Penicillin
C) Morphine D) Diazepam

118. The first effective antibiotic drug introduced clinically was
A) Sulphanilamide B) Gentamicin
C) Penicillin D) Chloramphenicol

119. Match the following items of column I and column II

Column I	Column II
(i) Antacid	a) loratadine
(ii) Analgesics	b) Barbituric acid
(iii) Tranquiliser	c) Aspirin
(iv) Antihistamine	d) Cimitidine

A) i – d, ii - a, iii – b, iv - c B) i – d, ii - b, iii – a, iv - c
C) i – b, ii - a, iii – d, iv - c D) i – d, ii - c, iii – b, iv - a

120. An alkaloid which is used as an antimalarial drug is
A) Morphine B) Nicotine
C) Quinine D) Caffeine