1. Which one of the following indicates the correct order of variation in atomic size?
    A) $B > Be > C > N$ B) $Be > C > N > B$
    C) $Be > B > C > N$ D) $N > C > B > Be$

2. Which of the following elements is metalloid?
    A)   C   B)   P   C)   Pb   D)   As

3. The second ionization energy of C,N,O and F is of the order
    A) $C < N < O < F$ B) $C < N < F < O$
    C) $O < N < C < F$ D) $C < F < O < N$

4. The binding energy per nucleon of ^{16}O and ^{17}O are 7.98 MeV and 7.76 MeV respectively then the energy required in MeV to remove a neutron from ^{17}O is
    A)   3.58   B)   7.76   C)   4.24   D)   7.98

5. The reciprocal of decay constant λ is called
    A)   Average life   B)   Half life
    C)   Natural life   D)   Root mean life

6. The highest oxidation state among transition elements is
    A)   +7 by Mn   B)   +8 by Os&Ru
    C)   +9 by Rh   D)   +6 by Cr

7. Which among the following is the most acidic aqua ions
    A) $[Fe(H_2O)_6]^{3+}$ B) $[Fe(H_2O)_6]^{2+}$
    C) $[Cr(H_2O)_6]^{3+}$ D) $[Co(H_2O)_6]^{3+}$

8. The strong yellow colour of Ce^{+4} ions is due to
    A)   d-d transition
    B)   f-f transition
    C)   Metal to ligand charge transfer
    D)   Ligand to metal charge transfer

9. The most effective method of separation and purification of lanthanides is by
    A)   Ion exchange column   B)   Fractional crystallization
    C)   Solvent extraction   D)   Complex formation

10. +2 oxidation states among the lanthanides are shown by
    A)   Ce & Pr   B)   Pm & Nd
    C)   Eu & Yb   D)   Gd & Lu

11. Which of the following shows coordination isomerism?
    A) $[Co(NH_3)_6][Cr(CN)_6] \& [Cr(NH_3)_6][Co(CN)_6]$
    B) $[PtCl_2(NH_3)_4]Br_2 \& [PtBr_2(NH_3)_4]Cl_2$
    C) $[Co(NO_2)(NH_3)_5]Cl_2 \& [Co(ONO)(NH_3)_5]Cl_2$
    D) $[Co(NH_3)_5Br]SO_4 \& [Co(NH_3)_5SO_4]Br$

12. Which of the following statements is/are true?
    I. $[Ni(CO)_4]$ is tetrahedral and diamagnetic
    II. $[NiCl_4]^{2-}$ is square planar and paramagnetic
    III. $[Fe(CN)_6]^{4-}$ is octahedral and diamagnetic
    IV. $[Fe(CN)_6]^{3-}$ is octahedral and diamagnetic

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

13. The IUPAC name of the complex $[CrCl(OH)(H_2O)_2(NH_3)_2]NO_3$ is
    A) Chlorohydroxodiaquadiamminechromium(III)nitrate
    B) Diaquadiamminechlorohydroxochromium(III) nitrate
    C) Diaquadiamminehydroxochlorochromium(III) nitrate
    D) Diamminediaquachlorohydroxochromium(III) nitrate

14. Jahn-Teller distortion is **not** shown by octahedral complexes with electronic configuration
    A) d^9 B) d^7 low spin
    C) d^4 high spin   D) d^7 high spin

15. The ground term symbol for V^{2+} ion is
    A) $^4F_{9/2}$ B) $^4F_{3/2}$ C) $^4G_{5/2}$ D) $^2G_{5/2}$

16. The possible number of J values for a ^3G term are
    A) 2   B) 3   C) 4   D) 9

17. The magnetic moment of a complex is $5.9\mu_B$. Which among the following is the complex?
    A) $[Co(H_2O)_6]^{3+}$ B) $[Fe(CN)_6]^{3-}$
    C) $[Fe(H_2O)_6]^{3+}$ D) $[Fe(H_2O)_6]^{2+}$

18. The strength of π- acceptor ligands increases in the order
    A) $CN^- < N_2 < CO < NO^+$ B) $CN^- < N_2 < NO^+ < CO$
    C) $CN^- < CO < N_2 < NO^+$ D) $N_2 < CN^- < CO < NO^+$

19. Which among the following complexes obey the 18 electron rule?
    (i) $Fe(C_5H_5)_2$, (ii) $Cr(C_5H_5)_2$, (iii) $Cr(C_6H_6)_2$, (iv) $V(CO)_6$

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

20. The structure of $Fe(CO)_5$ is
    A) Square pyramidal   B) Trigonal bipyramidal
    C) Pentagonal pyramid   D) Pentagonal

21. In oxyhemoglobin, iron is in
    A) High spin Fe(III)   B) Low spin Fe(III)
    C) High spin Fe(II)   D) Low spin Fe(II)

22. Hydroxylation of hydrocarbons by plants and animals are done by the biomolecule
    A) Vitamin B12   B) Ferridoxin
    C) Cytochrome P 450   D) Haemerythrin

23. In aluminothermite process, aluminium acts as
    A) Oxidising agent   B) Reducing agent
    C) Catalyst   D) Flux

24. Which among the following metals are purified by VanArkel tetraiodide decomposition method?
    Ti, Zr, Mn,Th
    A) Ti only   B) Zr only
    C) Ti & Mn only   D) Ti, Zr & Th only

25. Steel with very hard surface is prepared by
    A) Nitriding process   B) Cementation process
    C) Annealing process   D) Tempering process

26. The organometallic used in the hydroformylation of alkenes is
    A) $Ti(C_2H_5)Cl_3$ B) $CoH(CO)_4$
    C) $RhCl(PPh_3)_3$ D) $[Pt(C_2H_4)Cl_3]$

27. Which of the following is not a green solvent?
    A) H_2O B) CCl_4
    C) Ionic liquids   D) Liquid CO_2

28. KCl crystallizes in the NaCl type structure. If the radius of K^+ ions is138 pm and that of Cl^- ion is 182 pm, what is the unit cell dimension of KCl crystal?
    A) 389 pm   B) 236 pm
    C) 320 pm   D) 640 pm

29. A compound of A and B crystallizes in a cubic lattice in which atoms of A occupy the corners of the cube and B atoms occupy the centres of each of the cube faces. What is the formula of this compound?
    A) A_3B B) AB_2 C) AB_3 D) AB

30. An ionic compound crystallizing in cubic system showed powder diffraction pattern in which the lines are indexed respectively to 111, 200, 220, 311, 222, 400, 331, etc planes. The lattice is
A) Primitive cubic   B) BCC
C) FCC   D) End centered

31. Due to the presence of Schottky defects, the density of the crystal --------
A) Increases slightly   B) Increases appreciably
C) Decreases slightly   D) Remains the same

32. Match the following

Column I	Column II
(a) Fluorite	(i) $MgAl_2O_4$
(b) Antifluorite	(ii) $BaTiO_3$
(c) Spinel	(iii) CaF_2
(d) Perovskite	(iv) Na_2S

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

33. Which of the following types of crystals are usually piezoelectric?
A) Perovskite   B) Rutile
C) Rock salt   D) Zinc blende

34. In the following reaction $3Mg + N_2 \longrightarrow Mg_3N_2$
if 9 moles of magnesium and 6 moles of nitrogen are taken in a reaction vessel, then after the reaction
A) 9 moles of Mg_3N_2 will be formed
B) 15 moles of Mg_3N_2 will be formed
C) 6 moles of Mg_3N_2 will be formed
D) 3 moles of Mg_3N_2 will be formed

35. The number of H_3O^+ ions present in 10 mL of 0.1 N HCl solution is
A) 6.022×10^{23} B) 6.022×10^{22}
C) 6.022×10^{21} D) 6.022×10^{20}

36. The percentage by volume of C_3H_8 in a gaseous mixture of C_3H_8, CH_4 and CO is 30. When 100 mL of the mixture is burnt in excess of O_2, the volume of CO_2 produced is (All volumes measured under the same conditions of temperature and pressure)
A) 160 mL   B) 170 mL
C) 180 mL   D) 100 mL

37. Which of the following is a redox indicator?
   A) Methyl orange
   B) Bromothymol blue
   C) N-phenylanthranilic acid
   D) Xylenol orange

38. Nickel is gravimetrically estimated as a complex with
   A) Oxine
   B) Dimethylglyoxime
   C) EDTA
   D) Salycylaldemine

39. Which among the following is/are true?
   A) Instrumental errors arise because no instrument is perfect and so it will introduce errors into our measurements
   B) Method errors arise because no chemical procedure or reaction is perfect
   C) Personal errors are very subtle errors that we personally introduce into the experiment.
   D) All of the above

40. An analyst performed experiments and got the following results for the presence of lead in a water sample as 3.0, 2.9 and 3.1 ppm. The mean, median and standard deviation are respectively
   A) 3.0, 3.0 and 0.1 ppm
   B) 3.0, 2.9 and 3.1 ppm
   C) 2.9,3.0 and 0.01 ppm
   D) None of the above

41. The increasing order of stability among the following carbocations is
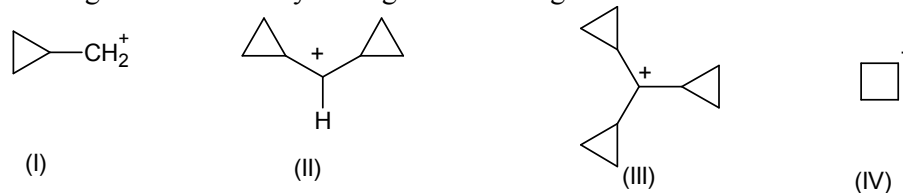
   (I)   (II)   (III)   (IV)

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

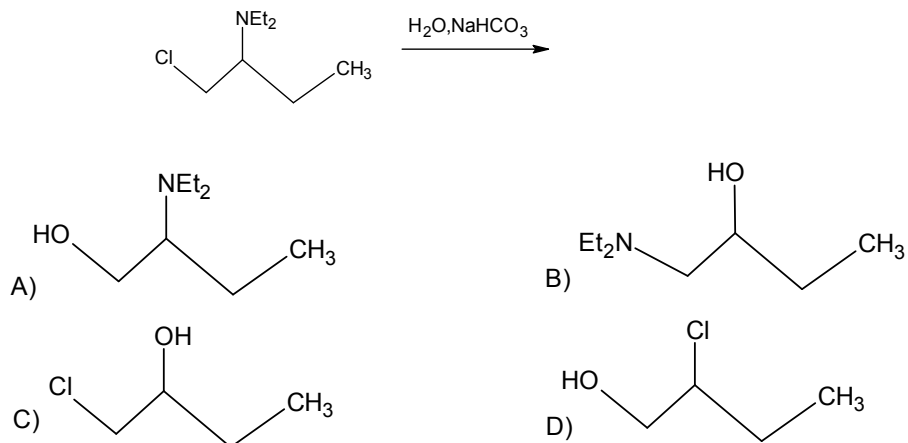42. The reactive intermediate formed in the following reaction is
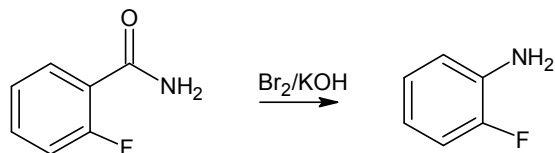
   A) Carbene
   B) Nitrene
   C) Benzyne
   D) Carbocation
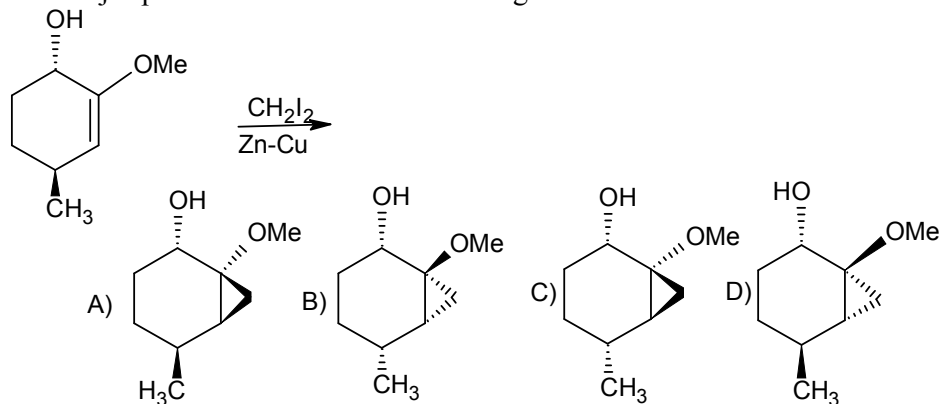
43. Which among the following is/are antiaromatic?
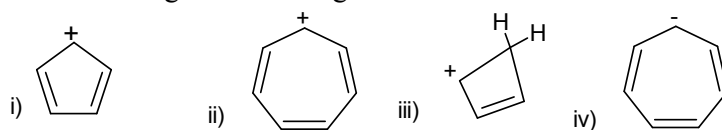
   i)   ii)   iii)   iv)

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

44. The major product formed in the following reaction is

A) structure with NEt₂, HO, CH₃

B) structure with HO, Et₂N, CH₃

C) structure with OH, Cl, CH₃

D) structure with Cl, HO, CH₃

45. The major product formed in the following reaction is

$\xrightarrow[\text{Zn-Cu}]{\text{CH}_2\text{I}_2}$

A) B) C) D) bicyclic structures with OH/HO, OMe, CH₃

46. Match the following reductions with suitable reagents

Name of reduction	Reagents
(a) Clemmensen reduction	(i) NH₂NH₂/KOH
(b) Birch reduction	(ii) Zn(Hg)/HCl
(c) Wolff- Kishner reduction	(iii) Aluminium isopropoxide
(d) MPV reduction	(iv) Li/NH₃

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

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

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

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

47. Alkylation of a ketone at the α- position can be done effectively by
   A)   Stork enamine reaction   B)   Friedel- Crafts alkylation
   C)   Ullmann reaction   D)   Reformatsky reaction

48. The rearrangement occuring in the following reaction is of the type
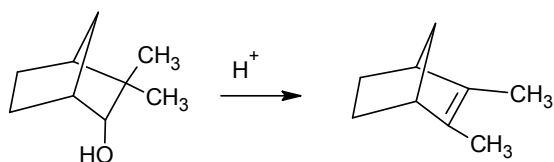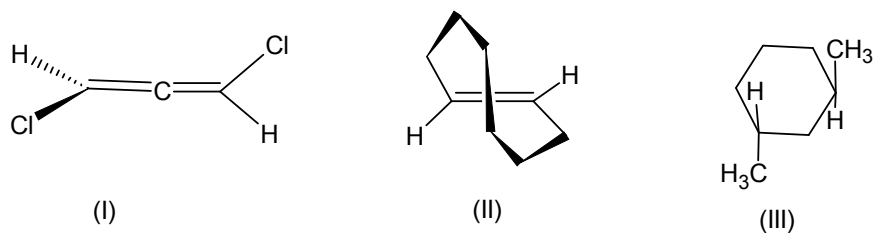

   A)   Beckmann   B)   Wagner- Meerwin
   C)   Claisen   D)   Curtius

49. The major product obtained in the following reaction is
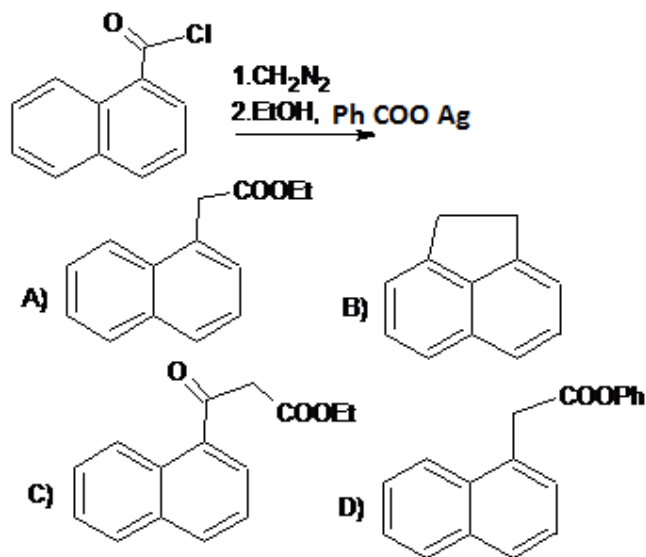
50. The major product obtained in the following reaction is

KOH
—————→

A)

B)

C)

D)
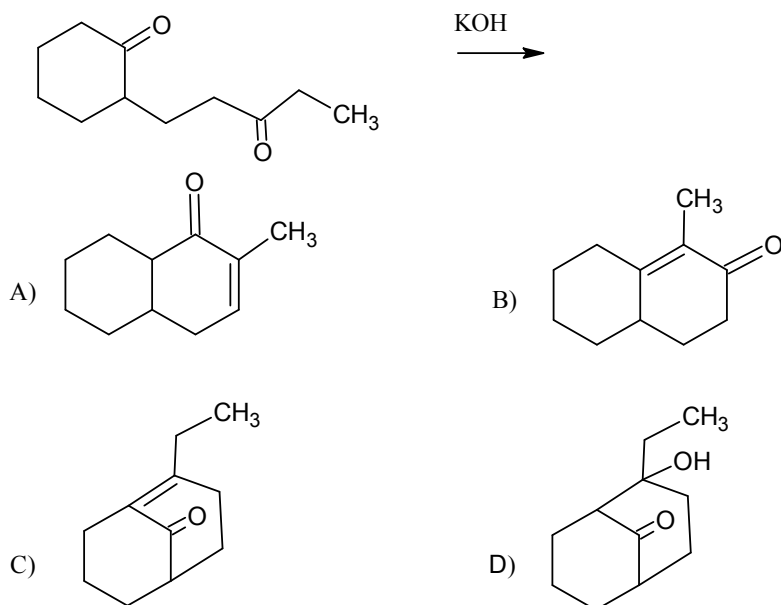
51. The following are chiral due to

(I)   (II)   (III)

A)   I-axial, II- helical, III-Plane   B)   I-axial, II-Plane, III-centre
C)   I-plane, II-axial, III-centre   D)   I-axial, II-helical, III-centre

52. The most stable conformation of the following compound is

A)   All equatorial
B)   t-Bu & OH axial, methyl equatorial
C)   t-Bu equatorial, methyl & OH axial
D)   t-Bu & Methyl equatorial, OH axial
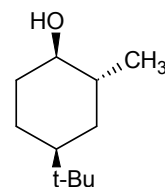
53. The most stable conformation of optically active butane-2,3-diol is

A)

B)

C)

D)
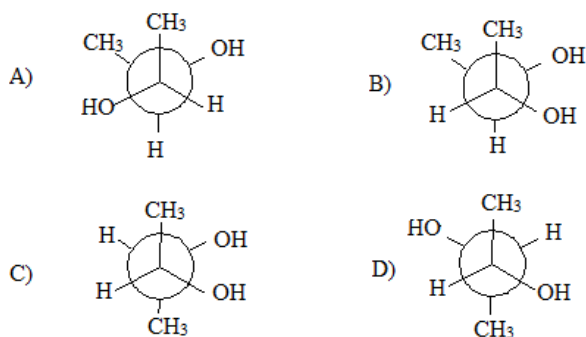
54. The absolute configuration of D-erythrose, HOH_2C⟋⟍CHO with OH groups is

A)   2R, 3S   B)   2R, 3R   C)   2S, 3R   D)   2S, 3S
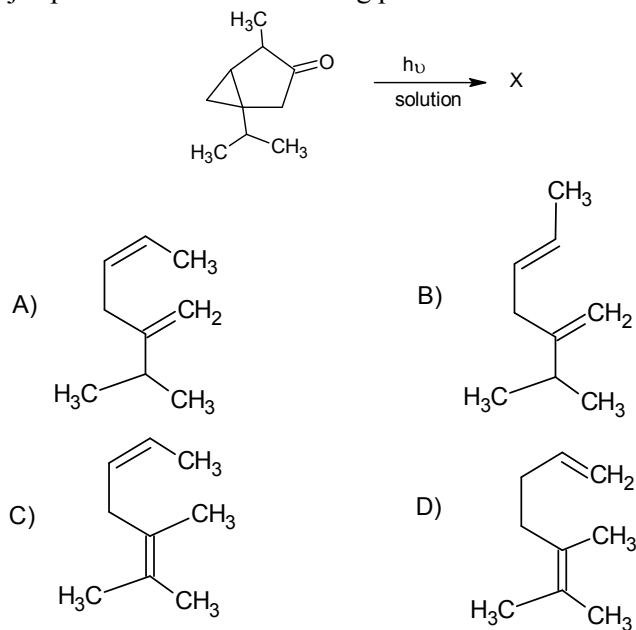
55. The most efficient method of resolution of racemic mixture is
A)   Mechanical separation   B)   Biochemical
C)   Chemical method   D)   Chiral column chromatography
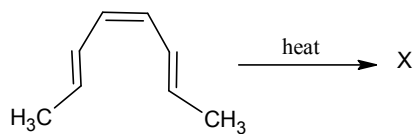
56. Which of the following transition represents phosphorescence?
A) $S_0 \longrightarrow S_1$

B) $S_2 \longrightarrow S_1$

C) $T_1 \longrightarrow S_0$

D) $T_1 \longrightarrow T_0$

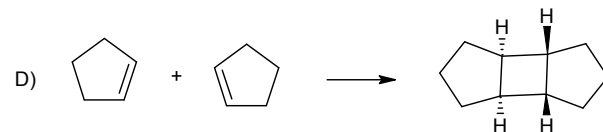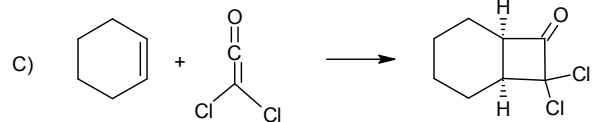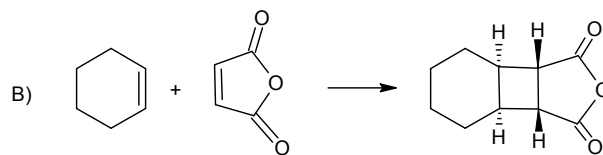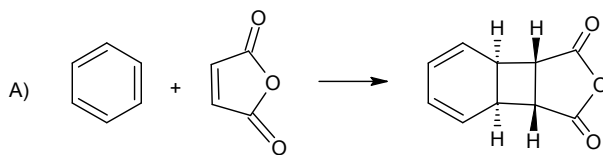57. The major product X in the following photochemical reaction is

A)
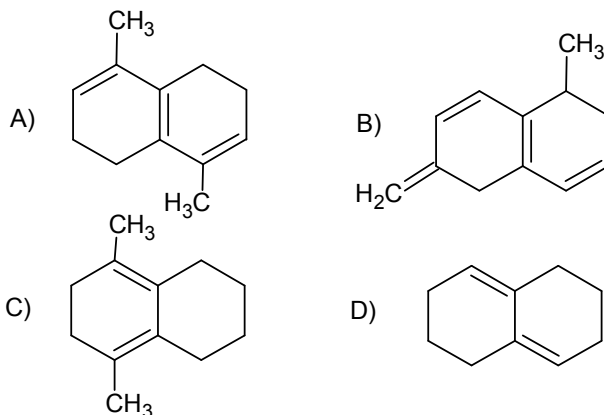

B)

C)

D)

9

58. Which of the following thermal sigmatropic rearrangement is impossible?
    A)   [1,3]H   B)   [1,5]H   C)   [1,7]H   D)   [3,3]

59. Predict the major product X in the following reaction?

A)

B)

C)

D)
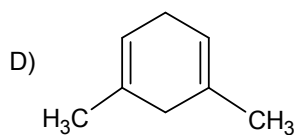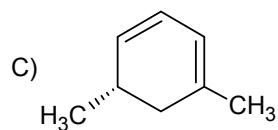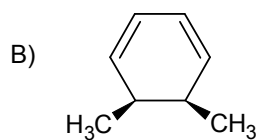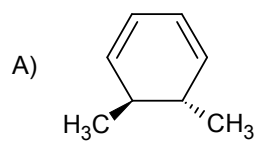
60. Which of the following cycloadditions occur thermally?

A)

B)

C)

D)

61. Which of the following compounds has maximum value for λ_{max}?

A)

CH$_3$

H$_3$C

B)

CH$_3$

H$_2$C

C)

CH$_3$

CH$_3$

CH$_3$

D)

62. The acetylenic C-H stretching vibration will occur in the region
   A)   3300 cm^{-1} B)   2950 cm^{-1}
   C)   3080 cm^{-1} D)   2700 cm^{-1}

63. The number of signals in ^{1}H NMR spectrum of $CH_3OCH_2CH_2CH_2OCH_3$
   A)   5   B)   2   C)   4   D)   3

64. The compound $C_5H_{10}O$ showed strong absorption band near 1710 cm^{-1}. The off resonance decoupled ^{13}C NMR spectrum had δ 205(s), 38(d), 22(q), 17(q). The structure of the compound is

A)

H$_3$C

H$_3$C

CHO

B)   H$_3$C

CH$_3$

O

C) H$_3$C

CHO

D)   H$_3$C

O

CH$_3$

CH$_3$
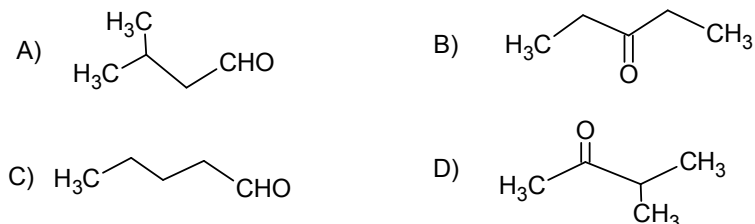
65. The mass spectrum of an alkyl halide showed M and M+2 peak intensities in the ratio 1: 1. The halogen present in the compound is
   A)   Fluorine   B)   Chlorine   C)   Bromine   D)   Iodine

66. The number of isoprene units in a diterpenoid is
   A)   2   B)   3   C)   4   D)   5

67. Which of the following statements is not correct in the case of papavarine?
   A)   It is an isoquinoline based alkaloid.
   B)   It is an optically active alkaloid.
   C)   It contains four methoxy groups.
   D)   It on oxidation with hot permanganate gives papaverinic acid.

68. Lipids which regulate physiological responses such as inflammation, blood pressure and pain
A) Prostaglandins
B) Phospholipids
C) Sphingolipids
D) Triacylglycerols

69. Which of the following are the four bases present in RNA?
A) Adenine, guanine, cytosine, thymine.
B) Adenine, guanine, uracil, thymine.
C) Adenine, guanine, cytosine, uracil.
D) Guanine, cytosine, thymine, uracil

70. Aminoacid mixtures are separated by electrophoresis on the basis of their respective isoelectric points(pI). The pI of lysine is

Lysine
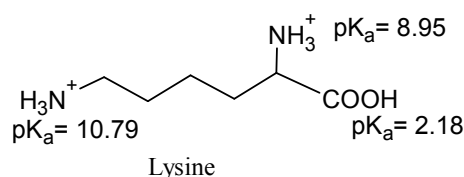
A) 5.56
B) 6.48
C) 7.31
D) 9.87

71. The hyperconjugative effect of the group R in R-CH=CH$_2$, where R is
CH$_3$- , CH$_3$CH$_2$-, or (CH$_3$)$_2$CH-   follow the order
A) CH$_3$- > CH$_3$CH$_2$- > (CH$_3$)$_2$CH-
B) (CH3)2CH- > CH3CH2- > CH3-
C) CH3- > (CH3)2CH- > CH3CH2-
D) (CH3)2CH- > CH3- > CH3CH2-

72. Which of the following carbohydrate has β-glycosidic linkage?
A) Cellulose
B) α-amylose
C) Amylopectin
D) Glycogen

73. Match the following

Column I	Column II
(a) Acrylonitrile	(i) Lucite
(b) Chloroprene	(ii) Orlon
(c) Methylmethacrylate	(iii) Nylon 6
(d) Caprolactam	(iv) Neoprene

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

74. Super glue is a polymer of
A) Styrene
B) Methyl α-cyanoacrylate
C) Vinyl acetate
D) Isobutene

75. Natural rubber is
   A) *cis* –poly(2-methyl-1,3-butadiene)
   B) *trans*- poly(2-methyl-1,3-butadiene)
   C) alternate *cis* and *trans* –poly(2-methyl-1,3-butadiene)
   D) *cis*- poly(1,3-butadiene)

76. Which of the following is a step growth polymer?
   A) Polystyrene   B) Teflon   C) Nylon 6-6   D) PVC

77. Melmac is a copolymer of
   A) toluene-2,6-diisothiocyanate & ethylene glycol
   B) teriphtalic acid & 1,4-diaminobenzene
   C) adipic acid & 1,6-hexanediamine
   D) melamine& formaldehyde

78. A mixture of benzoic acid, benzamide and ethylbenzoate is subjected to chromatographic separation by TLC. The distances moved by the three components is of the order
   A) Benzoic acid < Ethylbenzoate < Benzamide
   B) Benzamide < Benzoic acid < Ethylbenzoate
   C) Benzamide < Ethylbenzoate < Benzoic acid
   D) Ethylbenzoate < Benzamide < Benzoic acid

79. Which among the following is/are used as carrier gas in GC?
   H_2, N_2, He, Ar
   A) H_2 only   B) He &Ar only
   C) N_2 only   D) All the four

80. Which of the following is expected to give a blood- red colouration during Lassignes test of nitrogen?
   A) Aniline   B) Urea
   C) Thiourea   D) O-toluidine

81. Which of the following properties of light cannot be explained by quantum theory?
   A) Blackbody radiation   B) Photoelectric effect
   C) Diffraction   D) Atomic spectra

82. The solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility in moles/litre is
   A) 2×10^{-4} B) 8×10^{-4} C) 4×10^{-4} D) 5.6×10^{-4}

83. The number of planar nodes present in 5f-orbitals is
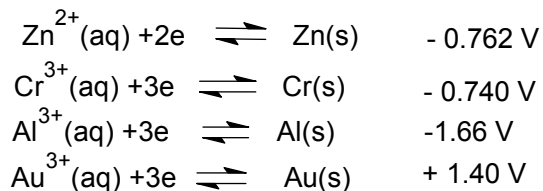   A) One   B) Two   C) Three   D) Four

84. According to variation principle, the energy E evaluated using a trial wave function will be related to the ground state energy E_0 as
A) $E \leq E_0$
B) $E \geq E_0$
C) $E = E_0$
D) $E \neq E_0$

85. The screening constant for the 2p electron in the nitrogen atom is
A) 3.1
B) 2.8
C) 2.6
D) 3.5

86. Bond order in CO is
A) 2
B) 2.5
C) 1.5
D) 3

87. Among the following orbitals of diatomic molecule, the bonding MO is
A) $1\sigma_u$
B) $2\sigma_u$
C) $1\pi_u$
D) $1\pi_g$

88. The hybridisation involved in the molecules PF_5 and BrF_5 respectively are
A) dsp^3 & d^2sp^3
B) sp^3d & $sp^3 d^2$
C) d^2sp^3 & d^2sp^3
D) $sp^3 d^2$ & $sp^3 d^2$

89. Which of the following molecules are in C_{2V} point group?
i. NH_3 ii. pyridine   iii. H_2O iv. $(CH_3)_2CO$

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

90. The C_{4v} point group has eight elements grouped into five classes. The order of the point group and the number of irreducible representations present in this group are respectively
A) 5 & 8
B) 8 & 5
C) 8 & 3
D) 8 & ∞

91. Identify the Mulliken symbol for the following irreducible representation.

E	C_3	C_2	i	S_6	σ_d
1	1	-1	-1	-1	1

A) A_{2u}
B) A_{1u}
C) A_{1g}
D) B_{2u}

92. Which of the following molecules are microwave active?
i. CO_2 ii. H_2O iii. CO   iv. N_2

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

93. All the three branches (P,Q & R) are seen in the vibration- rotational spectra of the molecule
A) CO
B) DCl
C) HCl
D) NO

94. Mossabauer spectrum of sodium nitroprusside consists of

A) singlet   B) doublet

C) triplet   D) multiplet

95. 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) i, iii & v only
C) ii & iii only   D) All of these

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

97. Helium atom is twice heavier than a hydrogen molecule. At 25°C the average K.E. of helium atom is
A) Half that of hydrogen
B) Four times that of hydrogen
C) Twice that of hydrogen
D) Same as that of hydrogen

98. The ratio between the most probable velocity of H_2 at 50K and that of O_2 at 800K
A) 1   B) 2   C) 4   D) 1/4

99. The ratio of the rates of diffusion of two gases P & Q is 4 : 1, the ratio of their molecular masses is
A) 1 : 16   B) 1 : 4   C) 1 : 2   D) 1 : 8

100. The type of liquid crystal used in LCD screens is
A) Cholestic   B) Nematic
C) Smectic   D) Lyotropic

101. An incorrect statement about work is
A) It is a path dependent function
B) An ideal gas expanding into vacuum does maximum work
C) Expansion work against external pressure (P_{ext}) is $P_{ext}dv$, where dv is infinitesimal change in volume
D) Expansion work in an isothermal reversible process for n moles of an ideal gas is, $-nRTln\frac{V_1}{V_2}$ (V_1 and V_2 are the initial & final volumes)

102. Which colligative property is most suitable for the determination of molecular mass of a protein?

A) Osmotic pressure
B) Elevation in boiling point
C) Depression in freezing point
D) Relative lowering of vapour pressure

103. The Joule – Thomson coefficient μ_{JT} is defined by

A) $\left(\frac{\partial T}{\partial P}\right)_S$ B) $\left(\frac{\partial P}{\partial T}\right)_S$ C) $\left(\frac{\partial P}{\partial T}\right)_H$ D) $\left(\frac{\partial T}{\partial P}\right)_H$

104. Camphor is often used as a solvent in molecular weight determination because
A) It is a solvent for many organic substances
B) It is readily available
C) It is volatile
D) It has high cryoscopic constant

105. If ΔG° is zero for a reaction, then
A) $\Delta H = 0$ B) $\Delta S = 0$
C) $K_{eqlm} = 1$ D) $K_{eqlm} = 0$

106. In a system containing $CaCO_{3(S)}$, $CaO_{(s)}$ & $CO_{2(g)}$ the number of components, number of phases and degrees of freedom are respectively

	C	P	F
A)	2	2	2
B)	2	3	1
C)	3	3	2
D)	1	2	1

107. In how many ways can two particles be distributed in five states of an energy level if the particle follows Bose- Einstein statistics?
A) 30 B) 20 C) 15 D) 10

108. In a second order reaction,
2A $\longrightarrow$ Product
if the concentration of A is doubled, the half- life of the reaction will be

A) Halved B) Unchanged
C) Doubled D) Quadrupled

109. For a chemical reaction which one of the following plots will be linear (k – rate constant)
A) k vs T B) log k vs T
C) log k vs log T D) log k vs 1/T

110. The expression for the rate constant (k_r) according to the absolute reaction rate theory is (K^* is the equilibrium constant for the activation)

A) $k_r = \dfrac{h}{kT} K^*$

B) $k_r = \dfrac{kT}{h} K^*$

C) $k_r = \dfrac{kT}{h} K^* e^{-E^*/RT}$

D) $k_r = \dfrac{kT}{h} K^* e^{-\Delta H^*/RT}$

111. For the reaction, A → Products, the plot of [A] *vs* time is a straight line. The order of the reaction is

A) Zero   B) One   C) Two   D) Three

112. Which of the following statements is not correct about chemisorption?
A) It involves chemical bonding between adsorbent and adsorbate
B) It involves high heat of adsorption
C) It involves multi-layer adsorption
D) It is irreversible in nature

113. According to Langmuir adsorption isotherm
A) Plot of $\dfrac{p}{x/m}$ versus $\dfrac{1}{p}$ is linear

B) Plot of $\dfrac{p}{x/m}$ versus p is linear

C) Plot of $\dfrac{1}{x/m}$ versus $\dfrac{1}{p}$ is linear

D) Plot of $\dfrac{1}{x/m}$ versus p is linear

114. Brownian movement is due to
A) Temperature fluctuation in the dispersion medium
B) Electrostatic interaction between dispersed phase and dispersion medium
C) Unbalanced impact of molecules of dispersion medium on dispersed phase
D) Convection current

115. Which among the following statements is not correct?
A) All solid catalysts follow heterogeneous catalytisis.
B) Heterogeneous catalysts function by providing an alternate pathway for the reaction in which the energy of activation is low.
C) Efficiency of a solid catalyst depends on surface area.
D) A catalyst may be deactivated by heating to a high temperature.

116. The relationship between mean ionic activity coefficient for $Ca_3(PO_4)_2$ and its ionic activity coefficients is given by

A) $\gamma_\pm = \gamma_+^3 \gamma_-^2$

B) $\gamma_\pm = \gamma_+^2 \gamma_-^3$

C) $\gamma_\pm^5 = \gamma_+^3 \gamma_-^2$

D) $\gamma_\pm^5 = \gamma_+^2 \gamma_-^3$

117. If Λ_c of 0.1M NH₄OH is 11.5Ω^{-1} cm² mol⁻¹, its degree of dissociation is
($\lambda^0_{NH_4^+}$= 73.4Ω^{-1} cm² mol⁻¹ and $\lambda^0_{OH^-}$= 197.6 Ω^{-1} cm² mol⁻¹)

A)   0.0608   B)   0.0424   C)   0.848   D)   0.0212

118. What will be the standard Gibbs free energy change for the cell reaction of the cell
Pt/Li(s) / Li⁺ // F⁻ / F₂(g) /Pt ?
Given $E^0_{F_2/F^-}$ = 2.87 V and $E^0_{Li^+/Li}$ = -3.05V

A)   -1142 kJ   B)   +1142 kJ
C)   -347 kJ   D)   +347 kJ

119. The standard potential at 298 K for the following half reactions are given against each:

Zn^{2+}(aq) +2e $\rightleftharpoons$ Zn(s)   - 0.762 V

Cr^{3+}(aq) +3e $\rightleftharpoons$ Cr(s)   - 0.740 V

Al^{3+}(aq) +3e $\rightleftharpoons$ Al(s)   -1.66 V

Au^{3+}(aq) +3e $\rightleftharpoons$ Au(s)   + 1.40 V

Which is the most powerful reducing agent?
A)   Zn   B)   Au   C)   Cr   D)   Al

120. Which among the following reference electrodes, whose emf is independent of pH, and so not suitable for measuring the pH of a solution?
A)   Glass electrode   B)   Calomal electrode
C)   Hydrogen electrode   D)   Quinhydron electrode

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