A

16104 **120 MINUTES**

1. In a molecule of phosphorous (V) oxide, there are
   A) 4 P- P, 10 P – O and 4 P = O bonds
   B) 4 P – O and 2 P = O bonds
   C) 6 P – P, 12 P – O and 4 P = O bonds
   D) 12 P – O and 4 P = O bonds

2. Which of the following elements has the highest third ionization energy?
   A) Mg B) Al C) Si D) P

3. Which among the following element has the lowest electron affinity?
   A) N B) Li C) Be D) Cl

4. A radioactive material has a half-life of 1386 years. Its average life is
   A) 1000 years B) 13860 years
   C) 20000 years D) 2000 years

5. What is Nitrolium?
   A) $CaCN_2$ B) CaC_2
   C) $CaCN_2 + C$ D) $CaC + CaCN_2$

6. Which of the following is/ are saline carbide?
   (i) CaC_2, (ii) Al_4C_3, (iii) KC_8, (iv) SiC

   A) (i) only B) (i) & (ii) only
   C) (i), (ii) & (iii) only D) All of these

7. Which of the following transition metal exhibits highest oxidation state?
   A) Mn B) Os C) Cr D) Ti

8. Horn silver is
   A) AgCl B) Ag_2S C) $AgSb_2S_5$ D) $AgNO_3$

9. Which among the lanthanides does not occur in nature?
   A) Pr B) Pm C) Gd D) Eu

10. Which among the following lanthanide ion is colourless?
    A) Pr^{3+} B) Nd^{3+} C) Gd^{3+} D) Eu^{3+}

11. The geometries of $NiCl_4^{2-}$ and $Ni(CN)_4^{2-}$ respectively are
    A) Square planar & square planar
    B) Tetrahedral & tetrahedral
    C) Square planar & tetrahedral
    D) Tetrahedral & square planar

12. Covalent nature of metal-ligand bond in complexes is not explained by
A) VB theory B) Crystal field theory
C) Ligand field theory D) MO theory

13. $[Co(H_2O)_6]^{2+}$ and $[CoCl_4]^{2-}$ show magnetic moments of 5.0 and 4.4 BM, respectively, because
A) The latter has lesser number of unpaired electrons
B) Of the quenching of the orbital contribution to the magnetic moment in the latter
C) Of antiferromagnetic property of the latter
D) Of spin-cross over phenomenon in the latter

14. The ground term symbol of a transition metal ion is ^4F .Thus the values of L and S are
A) L= 3, S= 3 B) L=3, S= 3/2
C) L= 2, S=3/2 D) L= 3, S= 1

15. The red colour of HgS is due to
A) LMCT B) MLCT
C) d-d transition D) σ -σ^* transition

16. The asymmetric nature of the UV visible spectrum of $[Ti(H_2O)_6]^{3+}$ is due to
A) Charge transfer transition B) Spin forbidden transition
C) p- d transition D) Jahn-Teller effect

17. At Neel temperature (T_N) a paramagnetic material is changed into
A) Diamagnetic B) Ferromagnetic
C) Antiferromagnetic D) Ferrimagnetic

18. The number of bridging carbonyls and M-M bonds in $Co_4(CO)_{12}$ are respectively
A) 3 & 6 B) 6 & 4 C) 6 & 6 D) 4 & 4

19. When back donation from metal to CO in metal carbonyl increases, then
A) Both M-C and C-O bond lengths become shorter.
B) M-C bond becomes stronger and C-O bond becomes weaker
C) Both M-C and C-O bonds become weaker
D) Both M-C and C-O bonds become stronger

20. Which among the following complexes does not obey 18 electron rule?
A) $Ni(CO)_4$ B) $Mn_2(CO)_{10}$
C) $V(CO)_6$ D) $Co_2(CO)_8$

21. The hapticity(η) of the ligand Cp in the following sandwich compounds (i)$Fe(C_5H_5)_2$ and (ii) $Be(C_5H_5)_2$ are respectively

A) 5 & 5 in (i), 5 & 5 in (ii) B) 5 & 5 in (i), 5 & 1 in (ii)
C) 5 & 1 in (i), 5 & 5 in (ii) D) 5 & 5 in (i), 4 & 4 in (ii)

22. Myoglobin and oxymyoglobin respectively are
A) Diamagnetic & diamagnetic B) Paramagnetic & paramagnetic
C) Diamagnetic & paramagnetic D) Paramagnetic & diamagnetic

23. Metalloenzymes responsible for the removal of H_2O_2 are
A) Carboxypeptidase & peroxidase
B) Carbonic anhydrase & Catalase
C) Peroxidase & Catalase
D) Ascorbate oxidase & cytochrome oxidase

24. Which among the following is an ore of titanium?
A) Monozite B) Ilmanite C) Malachite D) Calamine

25. The type of steel used for handling acids is
A) Silicon steel B) Chromium steel
C) Nickel steel D) Manganese steel

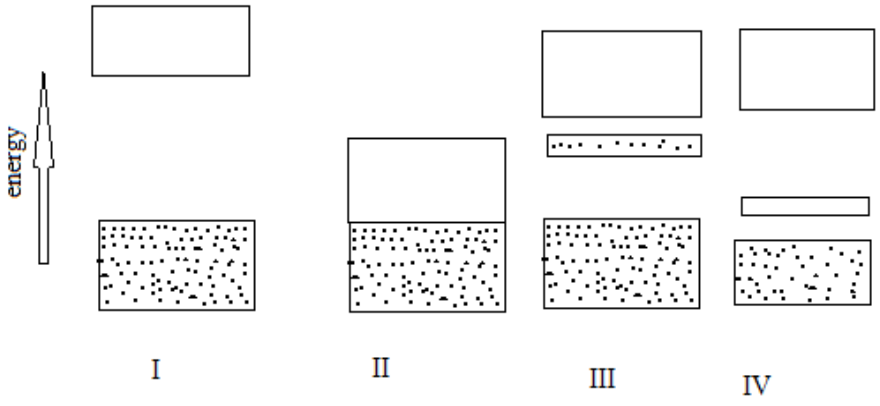
26. Silicon used in electronic industry must be ultrapure. Which among the following method is used for the purification of silicon?
A) Van Arkel de Boer process B) Electrolytic refining
C) Zone refining D) Fractional crystallization

27. The catalyst and cocatalyst used in Wacker process respectively are
A) $Pd(PPh_3)_4$ & CuCl B) $CuCl_2$ & Pd
C) $[PtCl_4]^{2-}$ & $CuCl_2$ D) $PdCl_2$ & $CuCl_2$

28. Enantioselective hydrogenation of prochiral alkenes are done by
A) Wilkinson's catalyst B) Zeigler- Natta catalyst
C) Raney Ni D) Monsanto process

29. The co-ordination numbers of Zn^{2+} and S^{2-} in zinc blende are respectively
A) 6, 6 B) 4, 6 C) 4, 4 D) 8, 8

30. The band structure of a p-type semiconductor is



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

31. An example of a solid electrolyte is

A) NaCl B) α- AgI C) FeO D) Al_2O_3

32. The Miller indices of a crystal plane which cuts the three crystallographic axes at 3a, 2b and -2c are

A) $3\,2\,\bar{2}$ B) $2\,2\,\bar{3}$ C) $2\,3\,\bar{3}$ D) $3\,2\,\bar{3}$

33. Match the following

Column I	Column II
(a) $ZnFe_2O_4$	(i) Perovskite
(b) $MnCr_2O_4$	(ii) Antifluorite
(c) $CaTiO_3$	(iii) Spinel
(d) Na_2S	(iv) Fluorite
	(v) Inverse spinal

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

34. Classify the following unit cell into a proper crystal system: a = 1.08 nm, b = 0.947 nm and c = 0.52 nm; $\alpha = 41^0$, $\beta = 82^0$ and $\gamma = 95^0$

A) Triclinic B) Monoclinic
C) Orthorhombic D) Hexagonal

35. If 5litres of H_2O_2 produce 100 litres of oxygen at STP, the volume strength of H_2O_2 is

A) 5V B) 10V C) 20V D) 100V

36. If 0.5 mole of $BaCl_2$ is mixed with 0.2 mole of Na_3PO_4, the maximum number of moles of barium phosphate that can be formed is

A) 0.2 B) 0.5 C) 0.3 D) 0.1

37. A suitable reagent for the gravimetric estimation of lead is

A) Dimethylglyoxime B) KCNS
C) K_2CrO_4 D) HCl

38. Which among the following is/are metal ion indicators?
(i) Eriochrome blackT, (ii) Benzidine, (iii) Xylenol orange, (iv) Murexide

A) (i) , (ii) only B) (i), (iii) & (iv) only
C) (i), (ii) & (iii) only D) All of these

39. The proper no. of significant figures in 0.126; 20.9; 400.0; 0.0780 are respectively

A) Three; three; four; three B) Four; three; one; three
C) Three; two; one; three D) Four; three; four; five

40. In the estimation of Ca^{2+} ions using EDTA and Solochrome Black, substitution method is used. Why?

A) Ca^{2+} ions form less stable complexes than Mg^{2+} ions with the indicator, but more stable complex with EDTA

B) Ca^{2+} ions form more stable complexes than Mg^{2+} ions with the indicator, but less stable complex with EDTA

C) Ca^{2+} ions get precipitated as $Ca(OH)_2$

D) No suitable buffer solution for maintaining the pH is available.

41. Match List I (Reaction) with List II (intermediates)

List I	List II
a) Dieckmann condensation	i) Carbene
b) Friedel-Crafts alkylation	ii) Nitrene
c) Curtius rearrangement	iii) Carbocation
d) Riemer –Tiemann reaction	iv) Carbanion

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

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

42. The stability order of carbocations

A) $C_6H_5^+ < C_6H_5CH_2^+ < p\text{-}ClC_6H_4\text{-}CH_2^+$ B) $C_6H_5CH_2^+ < p\text{-}ClC_6H_4CH_2^+ < C_6H_5^+$

C) $C_6H_5^+ < p\text{-}ClC_6H_4\text{-}CH_2^+ < C_6H_5CH_2^+$ D) $C_6H_5CH_2^+ < C_6H_5^+ < p\text{-}ClC_6H_4CH_2^+$

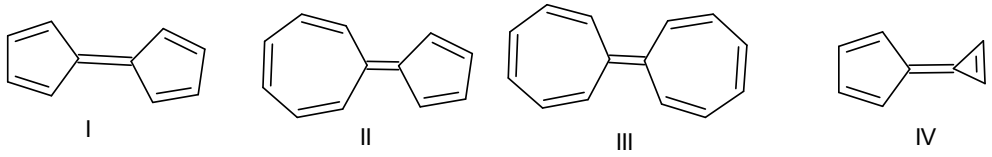
43. The stability order of the following free radicals is

$C_6H_5^{\cdot}$ (i) $C_6H_5CH_2^{\cdot}$ (ii) $(C_6H_5)_3C^{\cdot}$ (iii) $(C_6H_5)_2CH^{\cdot}$ (iv)

A) i < ii < iii < iv B) iv < ii < i < iii

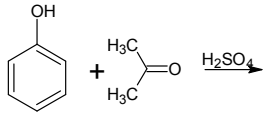
C) iv < iii < i < ii D) i < ii < iv < iii

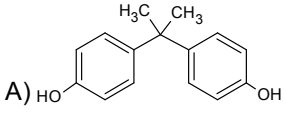
44. Which among the following can have permanent dipole moment?

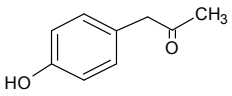


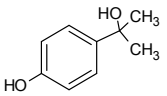
A) I, II & III B) II, III & IV C) II & IV D) I & IV

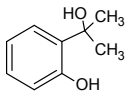
45. The major product in the following reaction is



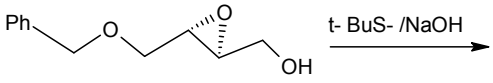
A) 

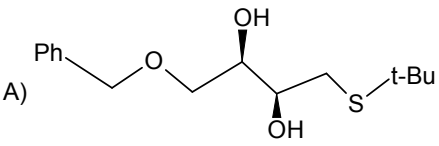
B) 

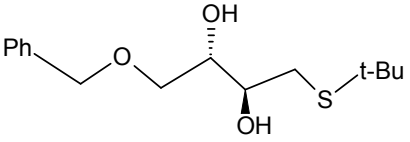
C) 

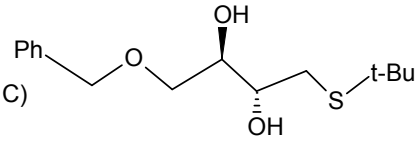
D) 

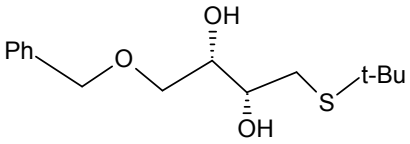
46. The major product of the following reaction is



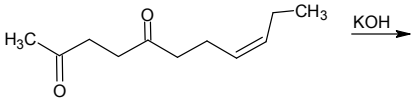
A) 

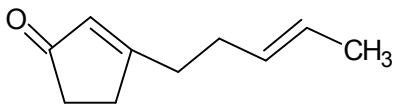
B) 

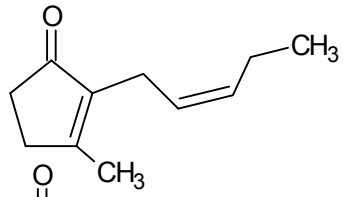
C) 

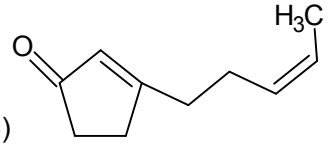
D) 

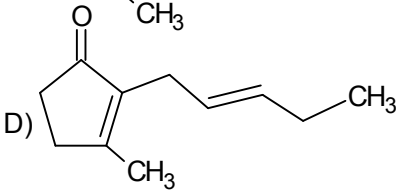
47. The major product of the following reaction is



A) 

B) 

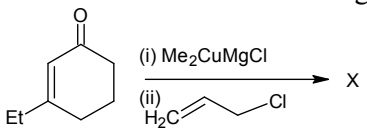
C) 

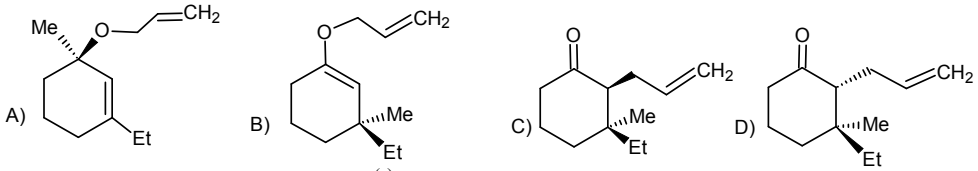
D) 

48. Intramolecular Claisen condensation is called

A) Michael Addition B) Robinson annulation
C) Perkin Condensation D) Dieckmann Condensation

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

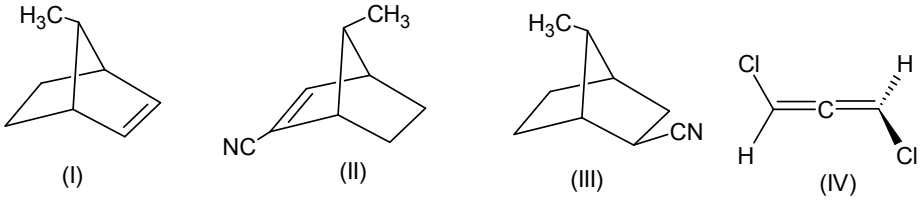




50. When alkyl halides react with $OH^{(-)}$ ions depending on solvent polarity the rate of

A) Reaction is not influenced by the solvent
B) S_N1 reaction increased with solvent polarity
C) S_N2 reaction is increased with solvent polarity
D) S_N1 reaction decreased with solvent polarity

51. Which of the following molecules are optically active?

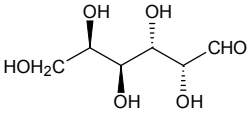


A) I, II, & IIIonly B) II & IV only
C) II, III, & IV only D) All the four

52. The compound CH_3 $(CHBr)_5CH_3$ has

A) 32 stereoisomers with 4 meso forms
B) 16 optical isomers and 4 meso forms
C) 16 optical isomers with no meso form
D) 12 optically active and 4 meso forms

53. The absolute configuration of the aldohexose given below is

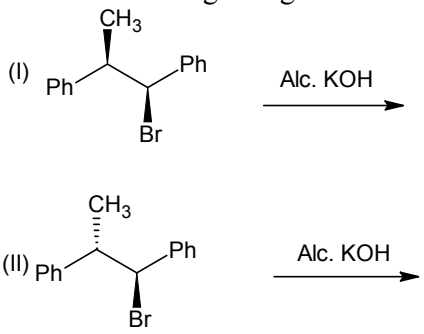


A) 2R, 3S, 4R, 5R B) 2R, 3S, 4S, 5R
C) 2S, 3R, 4R, 5S D) 2S, 3S, 4R, 5S

54. If the specific rotation of a pure *R*- enantiomer is -13.5^{o}and another sample of the same compound showed a specific rotation of +2.7^o. The ratio of the amounts of *R*- and *S*- enantiomers present in the sample is

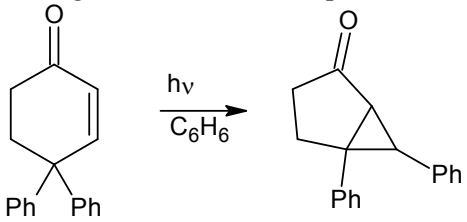
A) R: S = 3: 2 B) R: S = 3: 4 C) R: S = 2: 3 D) R:S = 4: 3

55. The correct statement regarding the following reactions is



A) (I) gives E-alkene & (II) gives Z-alkene and both reactions are stereospecific.
B) (I) gives Z-alkene & (II) gives E-alkene and both reactions are stereospecific.
C) Both (I) & (II) give E- alkene and both reactions are stereo selective
D) Both (I) & (II) give Z- alkene and both reactions are stereo selective

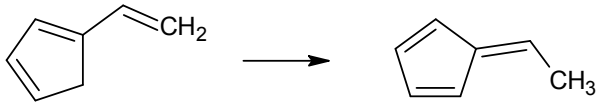
56. The following reaction is an example of



A) NorishType II reaction
B) Di-π- methane rearrangement
C) Lumiketone rearrangement
D) Paterno- Buchi reaction

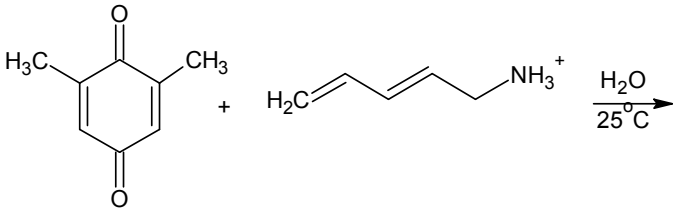
57. The reaction of hexa- 1,3,5-triene to give cyclohexa-1,3-triene is an example of
A) Diels Alder reaction
B) Sigmetropic reaction
C) Electro cyclic reaction
D) None of the above

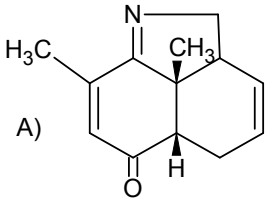
58. The correct statement of the following transfomation is

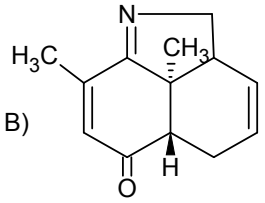


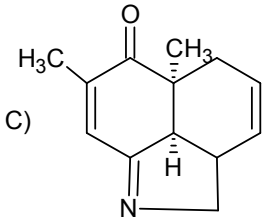
A) Photochemical antarafacial [1, 7]H shift
B) Photochemical suprafacial [1, 7]H shift
C) Thermal antarafacial [1, 5]H shift
D) Photochemical suprafacial [1, 5]H shift

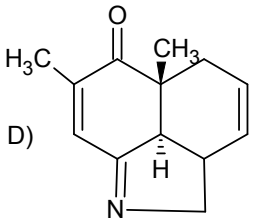
59. The major product of the following reaction is



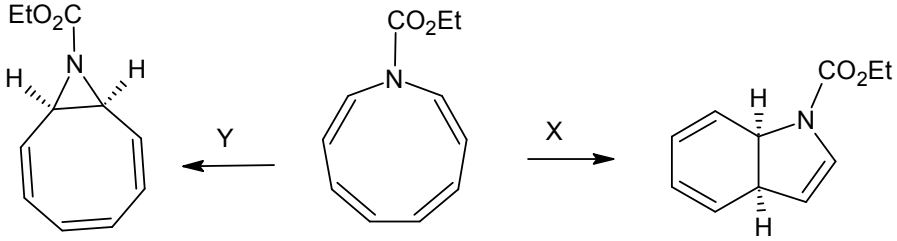








60. In the following reactions, the conditions X and Y are

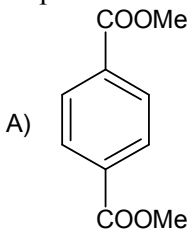


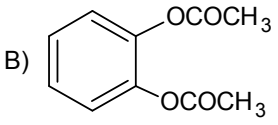
A) X = hν, Y = Δ B) X = Δ, Y = hν
C) X = hν, Y = hν D) X = Δ, Y = Δ

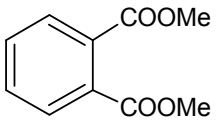
61. The IR stretching frequencies of C=O group in RCOOH, RCOCl, $(RCO)_2O$ and $RCONH_2$ varies as

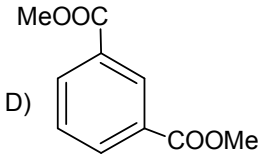
A) RCOCl < RCOOH < $(RCO)_2O$ < $RCONH_2$
B) $(RCO)_2O$ < $RCONH_2$ < RCOCl < RCOOH
C) $RCONH_2$ < RCOCl < RCOOH < $(RCO)_2O$
D) $RCONH_2$ < RCOOH < $(RCO)_2O$ < RCOCl

62. A compound with molecular formula $C_{10}H_{10}O_4$ showed a strong IR band at 1685 cm^{-1}. The ^{1}HNMR spectrum showed two doublets and one singlet. The compound is

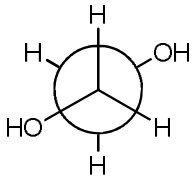
A) 

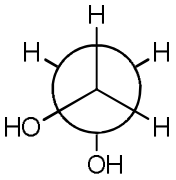
B) 

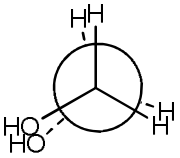
C) 

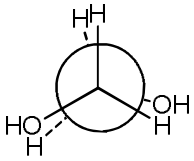
D) 

63. The most stable conformation of ethylene glycol is

A. 

B. 

C. 

D. 

64. In the mass spectrum of $CHBr_3$, ratio of the peaks at M/z 250, 252, 254, 256 respectively is

A) 1:3:3:1 B) 1:3:2:1 C) 3:1:1:3 D) 9:6:3:1

65. In the broad band decoupled ^{13}CNMR spectrum, the number of signals in anthracene and phenanthrene respectively are

A) Seven and seven B) Four and four
C) Seven and four D) Four and seven

66. When α-pinene is treated with ethanolic sulphuric acid it is converted to

A) β-pinene B) δ-pinene C) α-terpineol D) pinol

67. Which among the following statements about camphor is/are true?
(I) Camphor has two different asymetric centres, but only one pair of enantiomers exists.
(II) The cyclohexane ring in camphor is in the chair conformation.
(III) The cyclohexane ring in camphor is in boat conformation and there is a gem dimethyl bridge.

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

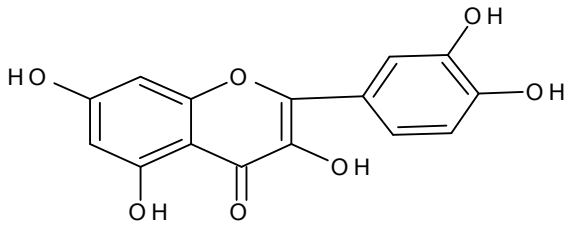
68. The number of heterocyclic nitrogen bases and the no. of chiral centres present in the alkaloid quinine are respectively

A) 2 & 5 B) 2 & 4 C) 1 & 5 D) 1 & 4

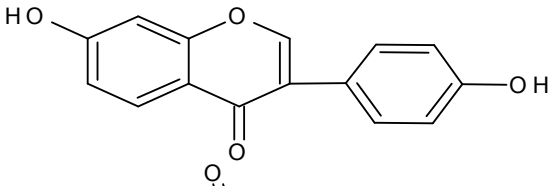
69. Match the following structures with the class of compounds

Column I

(I)



(II)



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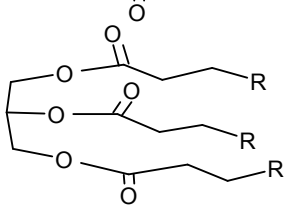
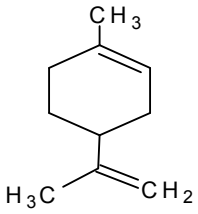


(IV)



Column II

a) monoterpene

b) lipid

c) flavone

d) isoflavone

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

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

70. The vitamin which is synthesised from sugar is

A) Vitamin A B) Vitamin K

C) Vitamin D D) Vitamin C

71. Treatment of the Tetrapeptide Gly – Arg – Phe – Ala with the enzyme Trypsin splits the peptide into

A) Gly +Arg – Phe – Ala B) Gly – Arg + Phe – Ala

C) Gly – Arg – Phe + Ala D) Gly + Arg + Phe + Ala

72. The bases which is not present in DNA is

A) Adenine B) Thymine

C) Uracil D) Cytosine

73. The polysaccharide present in animal tissue is

A) Glycogen B) Amylopectin
C) α-amylose D) Inulin

74. Which among the following is **not** formed by radical polymerisation?

A) Polythene B) PVC C) Polystyrene D) Nylon-6

75. Which among the following are biodegradable polymers?

(i) Polyhydroxybutyrate (ii) Polyhydroxyvalerate
(iii) Polycaprolactone (iv) Polyvenylalcohol

A) (i) , (ii) only B) (i), (iii) only
C) (i), (ii) & (iv) only D) All of these

76. Match the following

Column I	Column II
(a) Acrilan	(i) $C_6H_5CH=CH_2$
(b) Plexiglass	(ii) $CF_2=CF_2$
(c) Styrene	(iii) $CH_2=CHCN$
(d) Teflon	(iv) Methyl methacrylate

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

77. Which of the following polymer is **not** having cross-linkages?

A) Bakelite B) Melmac
C) Polythene D) Vulcanised rubber

78. The order of increasing eluting power of the following solvents in column chromatography is

A) Chloroform < Benzene < Hexane < Ethanol
B) Hexane < Benzene < Chloroform < Ethanol
C) Hexane < Chloroform < Benzene < Ethanol
D) Hexane < Ethanol < Chloroform < Benzene

79. In the detection of nitrogen, the blue / green colour is due to the formation of

A) $Fe_4[Fe(CN)_6]_3$ B) $Fe_3[Fe(CN)_6]_2$
C) $Na_3[Fe(CN)_6]$ D) $Na_4[Fe(CN)_6]$

80. Platinum- salt method is used for the determination of molecular weight of

A) Carboxylic acids B) Amines
C) Aldehydes D) Phenols

81. The first emission line of Balmer series of He^+ -spectrum has wave no. in cm-1(R_H = Rydberg constant)

A) $\frac{3}{4}R_H$ B) $\frac{5}{36}R_H$ C) $\frac{5}{9}R_H$ D) $\frac{1}{4}R_H$

82. Which of the following is an eigen function of the operator $\hat{P}_x$?
A) e^{ikx} B) xe^{ikx} C) $x^2 + 2x$ D) cos2x

83. The angular momentum of an electron in the 4d-orbital is
A) $\frac{2h}{\pi}$ B) $\sqrt{2}\frac{h}{2\pi}$ C) $\sqrt{3}\frac{h}{2\pi}$ D) $\sqrt{6}\frac{h}{2\pi}$

84. The average radius of 1s orbital of H-atom is
A) a_0 B) $2a_0$ C) $1.5a_0$ D) $3a_0$

85. The number of radial nodes present in 4f-orbitals is
A) Zero B) One C) Two D) Three

86. If a trial wave function is used to calculate the energy of a quantum mechanical system, the calculated energy is always greater than the true energy. This statement is related to
A) Perturbation theory
B) Variation principle
C) Born-Oppenheimer approximation
D) Heizenberg's uncertainty principle

87. According to MO theory the ground state wave function including spin of H_2 molecule isrepresented as

A) $\frac{1}{\sqrt{2}}\begin{vmatrix}\sigma_g 1s(1)\alpha(1) & \sigma_g 1s(1)\beta(1)\\ \sigma_g 1s(2)\alpha(2) & \sigma_g 1s(2)\beta(2)\end{vmatrix}$ B) $\frac{1}{\sqrt{2}}\begin{vmatrix}\sigma_u 1s(1)\alpha(1) & \sigma_u 1s(1)\beta(1)\\ \sigma_g 1s(2)\alpha(2) & \sigma_g 1s(2)\beta(2)\end{vmatrix}$

C) $\frac{1}{\sqrt{2}}\begin{vmatrix}\sigma_g 1s(1)\alpha(1) & \sigma_g 1s(2)\beta(2)\\ \sigma_g 1s(1)\beta(2) & \sigma_g 1s(2)\alpha(1)\end{vmatrix}$ D) $\frac{1}{\sqrt{2}}\begin{vmatrix}\sigma_g 1s(1)\alpha(1) & \sigma_u 1s(1)\beta(1)\\ \sigma_g 1s(2)\alpha(2) & \sigma_u 1s(2)\beta(2)\end{vmatrix}$

88. The angle between the two hybrid orbitals ψ_1 and ψ_2 shown below is

$\psi_1 = \frac{1}{\sqrt{3}}2s - \frac{1}{\sqrt{6}}2p_x + \frac{1}{\sqrt{2}}2p_y$

$\psi_2 = \frac{1}{\sqrt{3}}2s - \frac{1}{\sqrt{6}}2p_x - \frac{1}{\sqrt{2}}2p_y$

A) 90^o B) 109.5^o C) 120^o D) 180^o

89. The product of $C_{2(x)}$ x $C_{2(y)}$ =
A) E B) σ_{xy} C) i D) $C_{2(z)}$

90. Molecules falling in which of the point groups possess a permanent dipole moment?
A) C_i, C_s, C_n, C_{nv} B) C_{nv}, C_s, C_i, C_{nh}
C) C_{nv}, C_{nh}, C_s D) C_i, C_s, D_{nh}

91. The character table of C_{2v} point group is given below. The reducible representation of the translational degrees of freedom Γ_{tran} is

C_{2v}	E	C_2	σ_{xz}	σ_{yz}		
A_1	1	1	1	1	z	x^2,y^2,z^2
A_2	1	1	-1	-1	Rz	xy
B_1	1	-1	1	-1	x,Ry	xz
B_2	1	-1	-1	1	y, Rx	yz

A) 3, 1, 1, 1 B) 3, -1, -1, 1
C) 3, -1, -1, -1 D) 3, -1, 1, 1

92. In the change of NO^+ to NO the electron is added to
A) σ orbital B) π orbital
C) σ^* orbital D) π^*orbital

93. Which of the following molecules are IR active?
(i) N_2, (ii) CO_2, (iii) $CH_2{=}{=}CH_2$, (iv) CH_4

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

94. The first line of R-branch in the vibration- rotation spectra of HI will occur at ($\bar{\nu}$ = 2309 cm^{-1}, B= 6.61 cm^{-1})
A) 2322.22 cm^{-1} B) 2337.66 cm^{-1}
C) 2325.44 cm^{-1} D) 2295.78 cm^{-1}

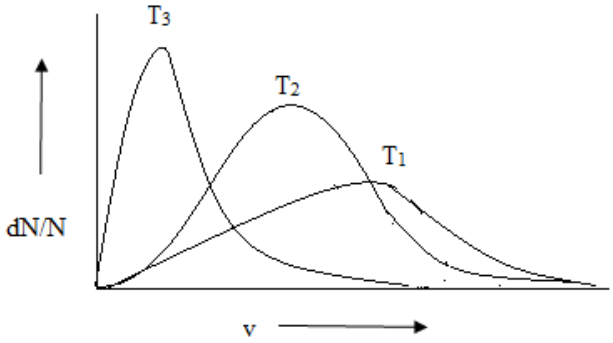
95. Which of the following would have the highest value?
A) Root mean square velocity
B) Most probable velocity
C) Mean velocity
D) Mean square velocity

96. The No. of hyperfine lines in the esr spectrum of $\dot{C}D_2CH_3$ radical is

A) 12 B) 15 C) 20 D) 25

97. The selection rule for rotational Raman spectra of linear rotors is
A) $\Delta J = \pm 1$ B) $\Delta J = \pm 1, \pm 2$
C) $\Delta J = 0, \pm 2$ D) $\Delta J = 0, \pm 1, \pm 2$

98. The distribution of molecular velocities of a sample at three different temperatures is represented below. The variation of temperatures is



A) $T_1 < T_2 < T_3$ B) $T_1 > T_2 < T_3$
C) $T_1 < T_2 > T_3$ D) $T_1 > T_2 > T_3$

99. Match the following transport properties of perfect gases

Column I		Column II	
a.	Coefficient of viscosity(η)	(i)	$\frac{1}{3}\lambda\bar{c}\ C_v[A]$
b.	Coefficient of thermal conductivity(κ)	(ii)	$\frac{1}{3}\lambda\bar{c}$
c.	Coefficient of diffusion(D)	(iii)	$\frac{1}{3}\lambda\bar{c}mN$

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

100. A mixture of hydrogen and oxygen in the 2:1 volume ratio is allowed to diffuse through a porous portion. The composition of gas coming out initially, vol of H_2 : vol of O_2, is

A) 8:1 B) 4:1 C) 2:1 D) 1:1

101. Find out the microstate for p^5

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

102. $\left(\frac{\partial U}{\partial V}\right)_T$ for an ideal gas is

A) Zero B) Positive
C) Negative D) Infinity

103. Which of the following may be used to define chemical potential?

(i) $\left(\frac{\partial G}{\partial n_i}\right) T, P, nj$ (ii) $\left(\frac{\partial H}{\partial n_i}\right) S, P, nj$

(iii) $\left(\frac{\partial A}{\partial n_i}\right) T, V, nj$ (iv) $\left(\frac{\partial U}{\partial n_i}\right) S, V, nj;\ \ i \neq j$

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

104. Which among the following is the condition for a reversible process?

A) $\Delta H_{(universe)} < 0$ B) $\Delta S_{(universe)} = 0$

C) $\Delta U_{(universe)} < 0$ D) $\Delta S_{(universe)} > 0$

105. For the following reaction, the partial pressures of CO_2 and CO are 4 and 8 atm. respectively at equilibrium at 1000K. Kp for the reaction is

$$C_{(s)} + CO_{2(g)} \rightleftharpoons 2\ CO_{(g)}$$

A) 32 atm B) 4 atm C) 16 atm D) 2 atm

106. In the pressure temperature diagram of a one component system, the point where the solid- liquid and liquid- vapour curves intersect is

A) Critical point B) Triple point

C) Melting point D) Boiling point

107. Internal energy in terms of partition function (Q) is given by

A) $kT^2\left(\frac{\partial lnQ}{\partial T}\right)_{V,N}$ B) $kT^2\left(\frac{\partial lnQ}{\partial T}\right)_{P,N}$

C) $kT\left(\frac{\partial lnQ}{\partial V}\right)_{T,N}$ D) $-kT\ln Q$

108. For the reaction $2\ A \rightarrow B + C$

$\frac{-d[A]}{dt} = k\ [A]^2$, $t_{1/2}$ of this reaction is

A) $\frac{1}{k}$ B) $\frac{1}{[A_0]^2 k}$ C) $\frac{1}{[A_0]k}$ D) $\frac{1}{[A_0]^3 k}$

109. A plot of log [A] versus time (t) gives a straight line with a negative slope. The order of the reaction is

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

110. The specific reaction rate of decomposition of a compound is represented by $\ln k = 11.5 - \frac{12510}{T}$. The energy of activation of the reaction in kJ/mol is

A) 250 B) 125 C) 85 D) 104

111. According to absolute reaction rate theory, the molar entropy of activation ΔS^* of an elementary bimolecular reaction is

A) Zero

B) Positive

C) Negative

D) Positive for endothermic reaction and negative for exothermic reaction

112. The number of electrons lost during electrolysis of 0.355 g of Cl^- is

A) 0.001 N_0 B) 0.01 N_0 C) 0.02 N_0 D) 0.01/2 N_0

113. The Freundlich adsorption isotherm is

A) $\theta = c_1 p^{1/c_2}$ B) $\theta = c_1 ln(c_2 p))$

C) $\theta = \frac{Kp}{1+Kp}$ D) Kp = $\frac{\theta}{1-\theta}$

114. Match the following

	Column I		Column II
a	Catalyst and reactants in different phase	i	Homogeneous catalysis
b	The phenomenon of one of the products acts as a catalyst	ii	Heterogeneous catalysis
c	Catalyst and reactants in the same phase	iii	Negative catalysis
d	When the catalyst reduces the speed of the reaction	iv	Auto catalysis

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

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

115. The presence of electrical charges on colloidal particles is used in

A) Ultra filtration B) Dialysis

C) Brownian movement D) Electrophoresis

116. The p^H of a mixture of 0.01M acetic acid and 0.1M sodium acetate is (p^{K_a} of acetic acid is 4.76)

A) 4. 46 B) 5.76 C) 3.76 D) 4.76

117. The ionic strength of a 0.05M Na_2SO_4 aqueous solution is

A) 0.15 M B) 0.25 M C) 0.025 M D) 0.05 M

118. Calomel electrode is reversible with respect to

A) Hg^{2+} B) $(Hg)_2^{2+}$

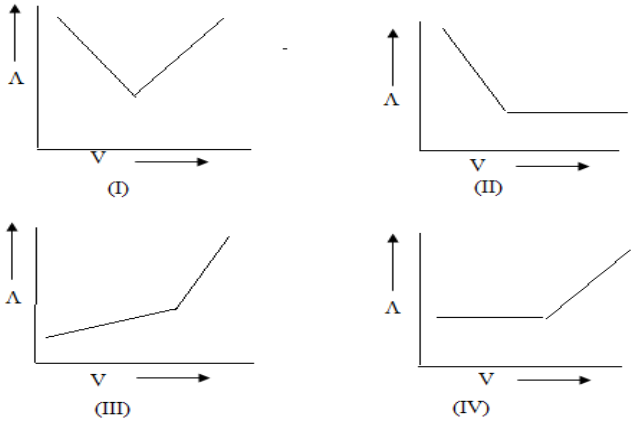
C) Both Hg^{2+} and Cl^- D) Cl^-

119. The emf of the concentration cell $Pt \mid H_2\ (1atm) \mid HCl(a_1) \;\vdots\; HCl(a_2) \mid H_2\ (1atm) \mid Pt$ is

A) E = $2t_- \frac{RT}{F} \ln \frac{(a_\pm)_2}{(a_\pm)_1}$ B) E =$2t_+ \frac{RT}{F} \ln \frac{(a_\pm)_2}{(a_\pm)_1}$

C) E = $2t_- \frac{RT}{F} \ln \frac{(a_\pm)_1}{(a_\pm)_2}$ D) E = $2t_+ \frac{RT}{F} \ln \frac{(a_\pm)_1}{(a_\pm)_2}$

120. Which of the following diagrams represent the conductometric titration curve of the precipitation reaction of KCl with $AgNO_3$?



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