



M.Sc. ENTRANCE CHEMISTRY DELHI UNIVERSITY 2018

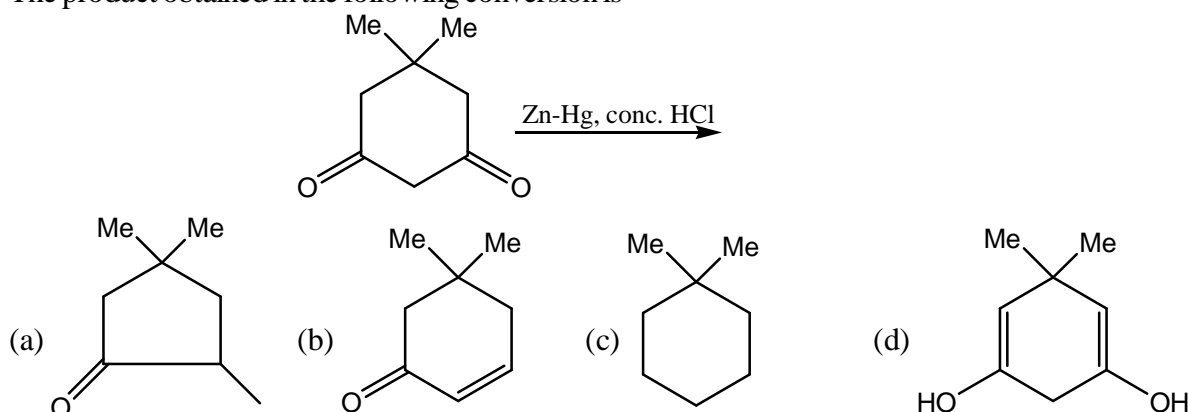
- The halogen having metallic character is
(a) Bromine (b) Chlorine (c) Iodine (d) Fluorine
- If the density of air is 1.2 g/lit, what is the volume occupied by 7.8g of air?
(a) 10.10 lit (b) 10 lit (c) 6 lit (d) 6.5 lit
- Which of the following statement(s) is/are true?
(a) All of these
(b) Adsorption increases with increase in pressure
(c) Adsorption decreases with increase in temperature
(d) Adsorption is an exothermic process
- Which of the following species represent the example of dsp^2 hybridization?
(a) $[\text{FeF}_6]^{3-}$ (b) $[\text{Fe}(\text{CN})_6]^{3-}$ (c) $[\text{Ni}(\text{CN})_4]^{2-}$ (d) $[\text{Zn}(\text{NH}_3)_4]^{2+}$
- Correct characteristics of the functional groups of adenine in DNA base pair are
(a) Both N(3) and C(6) NH_2 are hydrogen bond acceptors
(b) Both N(3) and C(6) NH_2 are hydrogen bond acceptors
(c) N(3) is a hydrogen bond acceptor and C(6) NH_2 is a hydrogen bond donor
(d) N(1) is a hydrogen bond acceptor and C(6) NH_2 is a hydrogen bond donor.
- Chemical potential is also known as
(a) Partial molar entropy (b) Partial molar Gibbs free energy
(c) None of these (d) Partial molar enthalpy
- From the following, which is more covalent?
(a) Al_2S_3 (b) AlN (c) Al_2Cl_6 (d) Al_2O_3
- The most probable candidate to form an octahedral complex is
(a) d^{10} (b) d^8 (high spin) (c) d^8 (low spin) (d) d^1 (low spin)
- Percentage of gold in 18 carat gold is
(a) 18 (b) 100 (c) 75 (d) 83.6
- Which pair from the following behaves as metalloid?
(a) Al and Zn (b) Rb and Cs (c) Br and I (d) Pt and I
- For a substitution reaction following a dissociative mechanism, the rate determining step is
(a) dependent on the solvent concentration
(b) dependent on the leaving group
(c) dependent on the entering group
(d) dependent on the nature of the complex
- The amino acid constituents of artificial sweetener given below are
(a) L-Aspartic acid and L-tyrosine (b) D-Glutamic acid and L-phenylglycine
(c) L-Aspartic acid and L-phenylalanine (d) L-Glutamic acid and L-phenylglycine



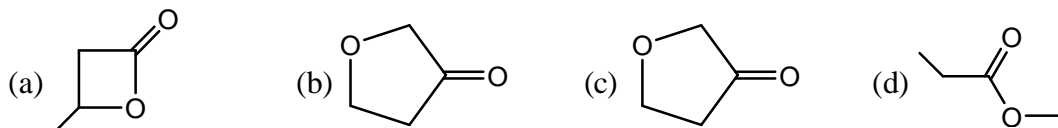
13. In the following statements, which one is incorrect?
(a) Atomic radius of Zr and Hf are same because of lanthanide contraction
(b) $\text{La}(\text{OH})_3$ is less basic than $\text{Lu}(\text{OH})_3$
(c) La is actually an element of transition series rather than lanthanides
(d) In lanthanide series, ionic radius of Lu^{3+} ion decreases
14. In the dichromate dianion
(a) 3 Cr–O bonds are equivalent (b) 6 Cr–O bonds are equivalent
(c) All the Cr–O bonds are non-equivalent (d) 4 Cr–O bonds are equivalent
15. Vacuum is measures of
(a) Leaking rate of air (b) Leaking rate of oil
(c) Leaking rate of moisture (d) Emptiness
16. The pre-exponential factor 'A' in the Arrhenius Equation depends on which of the following?
(a) Collision frequency (b) Gibb's free energy of reaction
(c) None of these (d) Energy of activation of the reaction
17. The process of heating the concentrated ore in a limited supply of air or in the absence of air is known as
(a) Roasting (b) Calcination (c) Cupellation (d) Leaching
18. Spectroscopic transitions leading to rotation of molecules will appear at which region of the electromagnetic spectrum?
(a) Ultraviolet (b) Radiofrequency (c) Infra-red (d) Microwave
19. The ground state of a harmonic oscillator has number of nodes
(a) 2 (b) 0 (c) 1 (d) 3
20. Tritium is a radioisotope of hydrogen, it undergoes disintegration to give
(a) α -particles (b) β -particles (c) Neutrons (d) X-rays
21. Which transitions are studied by UV spectrometer?
(a) Electronic (b) Vibrational (c) Nuclear (d) Rotational
22. What happens during digestion of a precipitate?
(a) Coalescence of smaller crystallites (b) Recrystallization takes place
(c) Completion of precipitation (d) Rate of the reaction increases
23. Among the following group of oxides, the group of oxides that cannot be reduced by carbon to give the respective metals is
(a) CaO , K_2O (b) Fe_2O_3 , ZnO (c) PbO , Fe_3O_4 (d) Cu_2O , SnO_2
24. In which of the following reaction migration of alkyl group from carbon to oxygen is observed?
(a) Pinacol-pinacolone rearrangement
(b) Preparation of phenol from cumene hydroperoxide
(c) Baeyer-villiger oxidation
(d) Both Baeyer-villiger oxidation and preparation of phenol from cumene hydroperoxide
25. Alkali metals form highly stable complexes with
(a) diethyl ether (b) Butadiene (c) Cryptand-222 (d) Cyclopentadiene
26. The unit of rate constant for a second order reaction is
(a) s^{-1} (b) $\text{mol}^{-2} \text{dm}^6 \text{s}^{-1}$ (c) $\text{mol dm}^{-3} \text{s}^{-1}$ (d) $\text{mol}^{-1} \text{dm}^3 \text{s}^{-1}$
27. What is the unit of specific resistance (or resistivity) of a conductor?
(a) Ohmcm^{-1} (b) Siemens^{-1} (c) $\text{Ohm}^{-1} \text{cm}$ (d) $\text{Siemens}^{-1} \text{cm}$



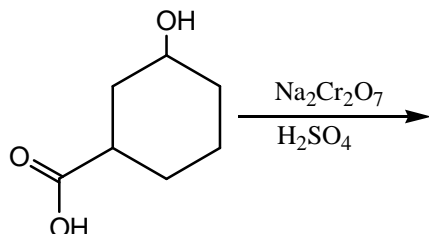
28. When a nucleophile encounters a ketone the site of attack is
 (a) both the carbon and oxygen atoms, with equal probability
 (b) the carbon atom of the carbonyl
 (c) the oxygen atom of the carbonyl
 (d) no attack occur as ketones do not react with nucleophiles
29. In the cases of gases adsorbing on solid, which of the following statement(s) is/are true?
 (a) Decrease in temperature of the system results in increase in adsorption
 (b) Decrease in pressure of the system results in decreases in adsorption
 (c) All of these
 (d) Adsorption is an exothermic process
30. During a disproportionation reaction,
 (a) Simultaneous oxidation and reduction of metal ion takes place
 (b) Metal ion goes to lower oxidation state
 (c) Metal ion goes to higher oxidation state
 (d) Metal ion remains unchanged in its oxidation state
31. The number of independent modes of vibration in a linear molecule having N atoms is
 (a) $3N-6$ (b) $3N-3$ (c) $3N$ (d) $3N-5$
32. A system that maintains a constant volume is known as
 (a) None of these (b) Isochoric system
 (c) Adiabatic system (d) Isotactic system
33. Cobalt is present in
 (a) Vitamin B₂ (b) Vitamin B₁ (c) Vitamin B₆ (d) Vitamin B₁₂
34. In collision theory of bimolecular gaseous reactions, the Collision frequency does not depend on
 (a) Pressure of the system (b) Number of molecules of each gas
 (c) Temperature of the system (d) Reduced mass of the system
35. An inorganic mixture dissolves in hot conc. HCl giving a blue colored solution which on addition of water becomes pink. The mixture contains
 (a) Fe³⁺ (b) Cr³⁺ (c) Ni²⁺ (d) Co²⁺
36. The Bragg's equation for crystallography can be written as
 (a) $n\lambda = (2d / \sin \theta)$ (b) $n\lambda = (2d \sin \theta)$
 (c) $n\lambda = (2 / d) \sin 2\theta$ (d) $n\lambda = 1 / (2d \sin \theta)$
37. The product X in the flowing reaction $6\text{LiH} + 8\text{BF}_3 \longrightarrow 6\text{LiBF}_4 + \text{X}$ is
 (a) B₄H₁₀ (b) B₂H₆ (c) B₃H₈ (d) BH₃
38. The product obtained in the following conversion is



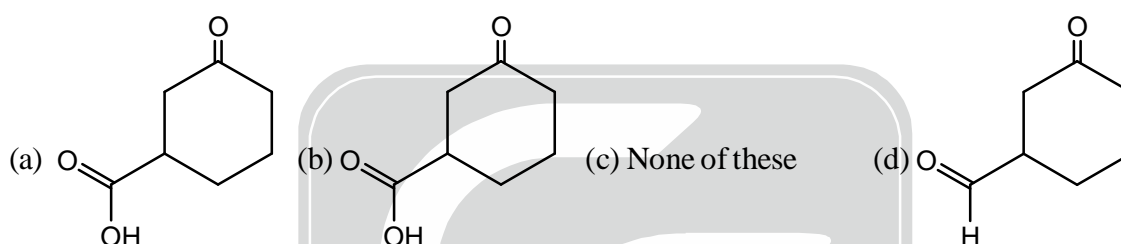
39. A compound with molecular formula $C_4H_6O_2$ shows band at 1770 cm^{-1} in IR spectra and peaks at 178, 68, 28, 22 ppm in ^{13}C NMR spectrum. The correct structure of the compound is



40. The product in the given reaction is



The product obtained is



41. Rank the following alkenes on order of increasing maximum wavelength

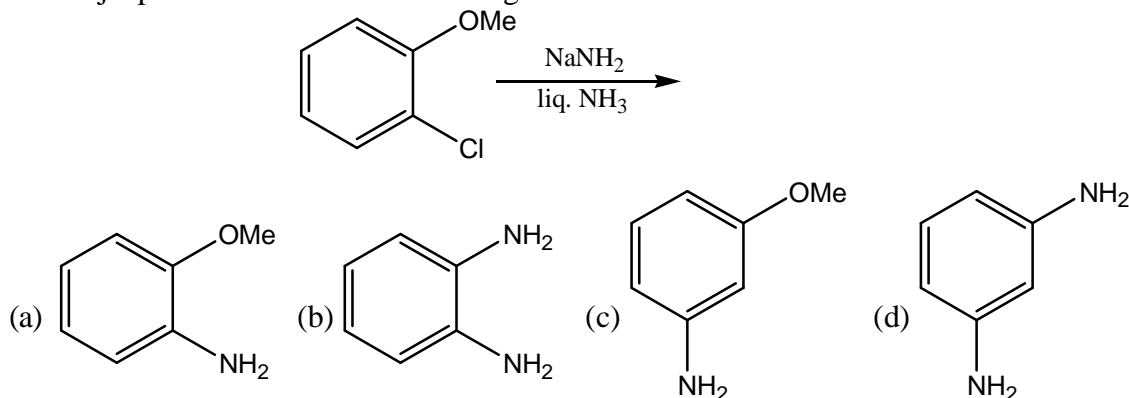


- (a) $I < II < III$ (b) $II < I < III$ (c) $I < III < II$ (d) $II < III < I$

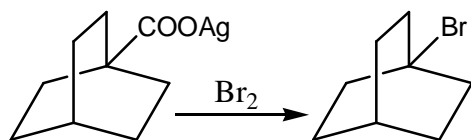
42. The correct relation between the following compound is



- (a) enantiomers (b) homomers (c) constitutional isomers (d) diastereomers
43. Tl^+ compounds are poisonous because
- (a) stop blood circulation (b) they attack liver
(c) cut-off breathing capability (d) they can cause blood infection
44. The major product formed in the following reaction is



45. Following reaction goes through?



- (a) carbene intermediate (b) free radical intermediate
(c) carbocation intermediate (d) carbanion intermediate

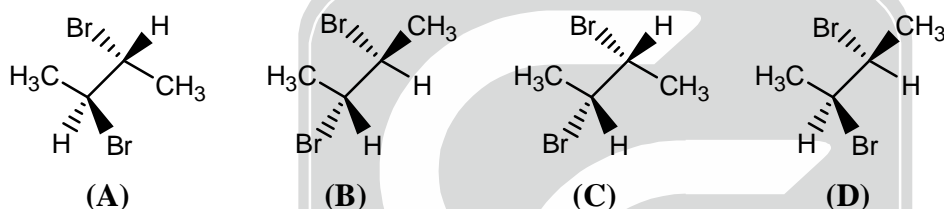
46. Consider an electrochemical reaction: Oxidized form + ne = reduced form. If an ion forms a complex with the oxidized form, then the following happens

- (a) The reduction potential of the system is increased
(b) The reduction potential of the system remains the same
(c) The effective concentration of the reduced form is increased
(d) The reduction potential of the system is lowered

47. Total orbital angular momentum of np⁶ electronic system is (a.u.)

- (a) 0 (b) 1/2 (c) 2 (d) 1

48. Identify the enantiomers among the following compounds



- (a) C and D (b) B and D (c) A and C (d) A and B

49. Match the following

List-I

- (A) Phosphorescence
(B) Intersystem Crossing
(C) Jablonski diagram
(D) Fluorescence

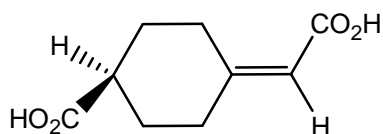
List-II

- (1) A schematic representation of the various types of radiative and non-radiative and non-radiative transitions that can occur in molecules
(2) Spontaneous emission of radiation arising from transitions between energy states of same multiplicity
(3) Non-radiative transitions between energy states of different multiplicity
(4) Spontaneous emission of radiation arising from transitions between energy states of different multiplicities.
(a) A-4, B-3, C-1, D-2 (b) A-4, B-3, C-2, D-1
(c) A-3, B-1, C-2, D-4 (d) A-1, B-2, C-3, D-4

50. The oxidation state of oxygen in O₂F₂ is

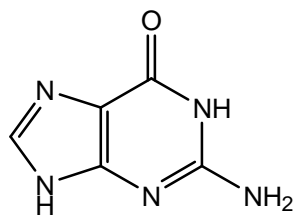
- (a) +2 (b) +1 (c) +4 (d) -2

51. The following molecule has



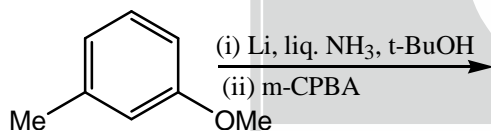
- (a) R-configuration (b) Centre of symmetry
(c) S-configuration (d) Plane of symmetry

52. In low chloride ion concentration, the anticancer drug cis-platin hydrolysis to give a diaqua complex and this binds to DNA via adjacent guanine.



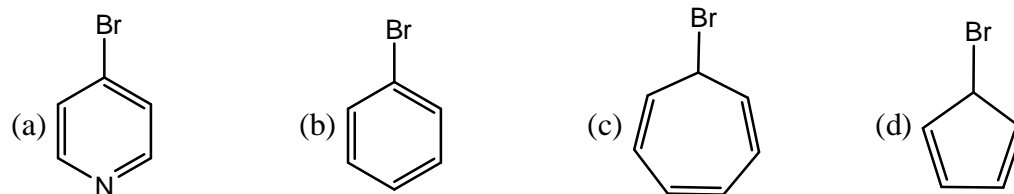
The coordinating atom of guanine to Pt(II) is

- (a) N9 (b) N7 (c) N1 (d) N3
53. Which of the following species is aromatic in nature?
- (I) (II) (III) (IV)
- (a) IV (b) I (c) II (d) III
54. Arrange the following in decreasing order of their acidity
- (I) (II) (III) (IV)
- (a) IV > II > I > III (b) IV > III > II > I (c) I > II > III > IV (d) I > IV > III > II
55. The major product formed in the following reaction sequence is

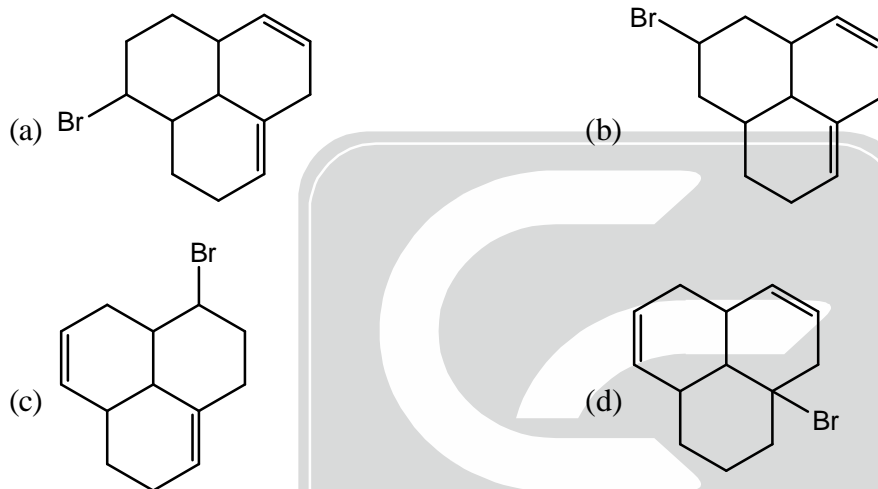
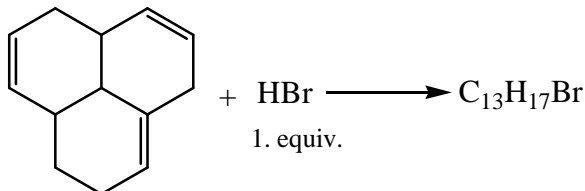


- (a) (b) (c) (d)

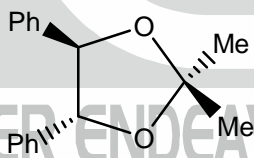
56. The compound that gives precipitate on warming with aqueous AgNO₃ is



57. What is the specific resistance (or resistivity) of a conductor with cross-sectional area 4 cm^2 , length 2 cm and resistance 8 ohms ?
 (a) $64 \text{ Siemens}^{-1} \text{ cm}$ (b) $16 \text{ Siemens}^{-1} \text{ cm}$ (c) $4 \text{ Siemens}^{-1} \text{ cm}$ (d) $1 \text{ Siemens}^{-1} \text{ cm}$
58. Which pair of ions cannot be precipitated by H_2S in dilute HCl ?
 (a) $\text{Al}^{3+}, \text{Ni}^{2+}$ (b) $\text{Bi}^{3+}, \text{Sn}^{4+}$ (c) $\text{Ni}^{2+}, \text{Cu}^{2+}$ (d) $\text{Zn}^{2+}, \text{Cu}^{2+}$
59. Which of the following bromides is the major product of the reaction shown below, assuming that there are no carbocation rearrangement?

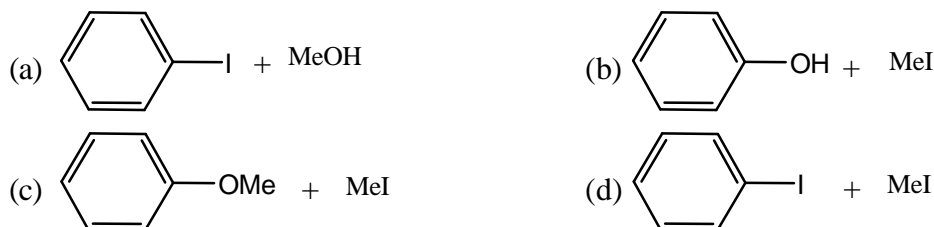
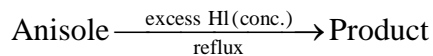


60. Methyl groups in the following compounds are

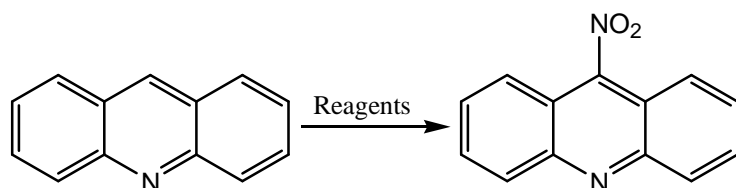


- (a) homotopic (b) enantiotopic
 (c) constitutionally heterotopic (d) diastereotopic

61. What is the principal product of the following reaction?

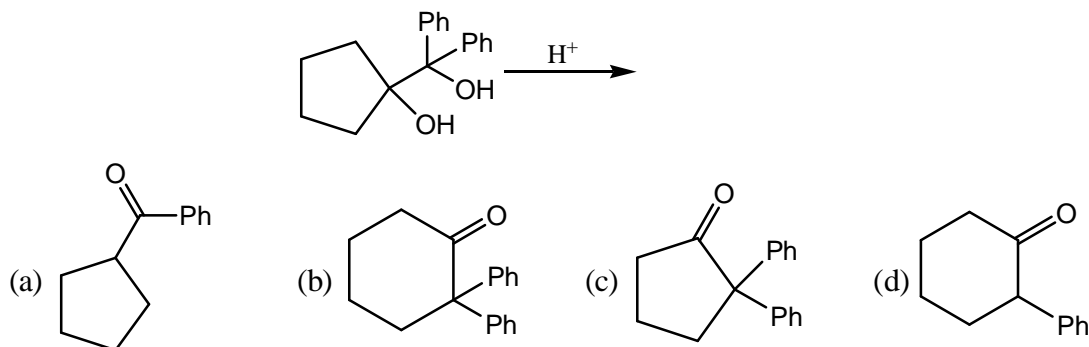


62. Provide the suitable reagents for this conversion:



- (a) m-CPBA, $\text{HNO}_3/\text{H}_2\text{SO}_4/\text{PCl}_3$ (b) $\text{HNO}_3/\text{H}_2\text{SO}_4/\text{POCl}_3$
 (c) $\text{NaNO}_2/\text{H}_2\text{SO}_4/\text{PCl}_3$ (d) $\text{H}_2\text{O}_2/\text{OH}^-$, $\text{HNO}_3/\text{H}_2\text{SO}_4/\text{PCl}_3$

63. Identify the major product of the reaction?

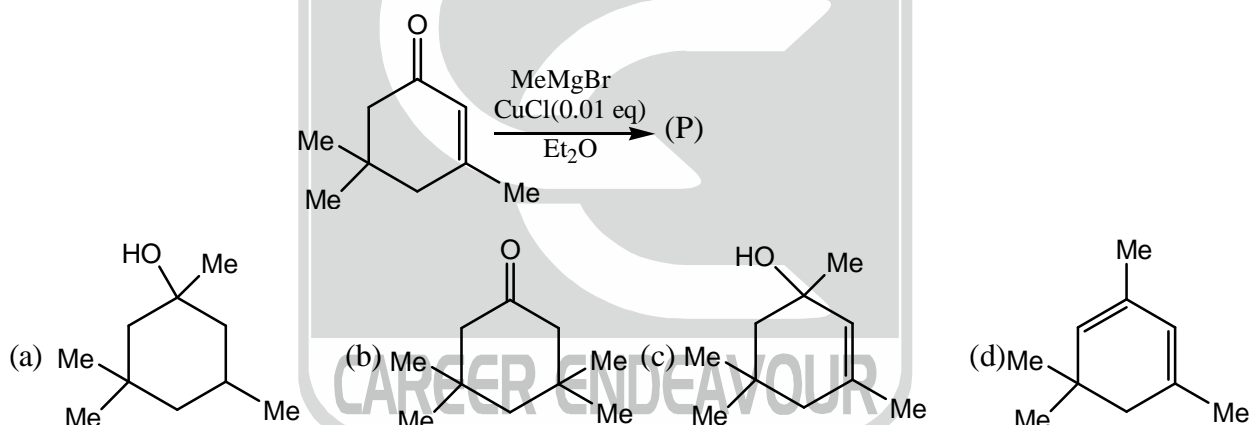


64. In the reaction given below,

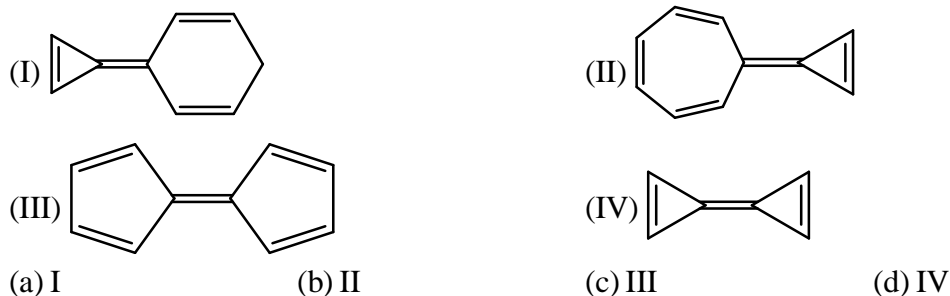


The compound A and B are:

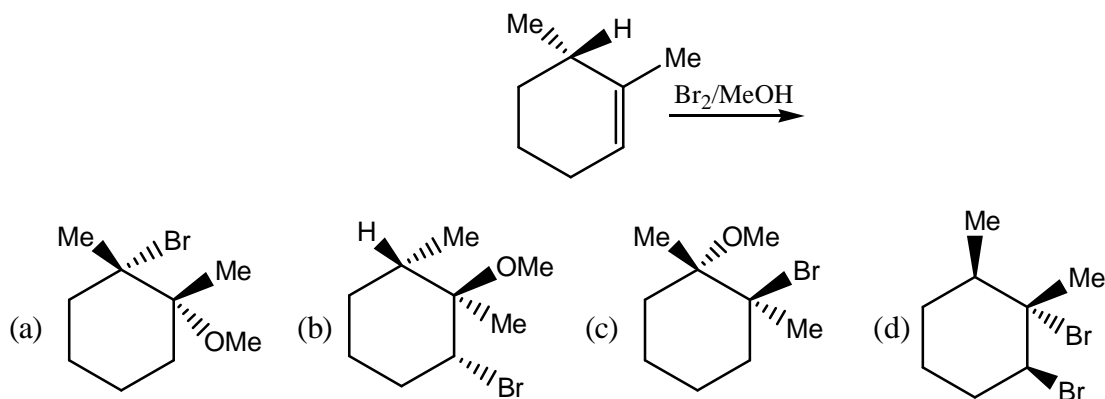
- (a) Metamers (b) Functional isomers (c) Chain isomers (d) Position isomers
65. Which is product of the reaction



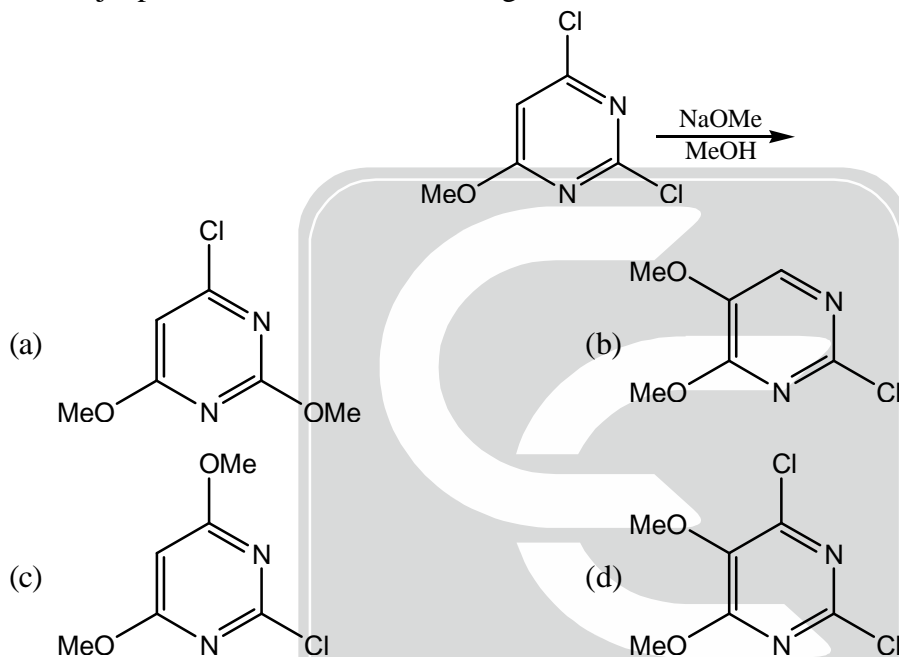
66. An ionic solution consists of 0.2 mol dm^{-3} each of A^{2+} and B^{3+} ions. What is the ionic strength of the solution?
 (a) 0.5 mol dm^{-3} (b) 1.0 mol dm^{-3} (c) 1.3 mol dm^{-3} (d) 2.6 mol dm^{-3}
67. The molar weight of MgCO_3 is 84. The volume in litres of CO_2 at STP on heating 8.4g of MgCO_3 would be
 (a) 2.24 (b) 11.2 (c) 22.4 (d) 1.12
68. It takes 20 minutes for the concentration of a radioactive species to decay to its 1/4th value of its original concentration. What is the rate constant of this radioactive decay reaction?
 (a) 865.8 s^{-1} (b) 600 s^{-1} (c) 415.8 s^{-1} (d) 0.001155 s^{-1}
69. Which of the following having the maximum Dipole moment?



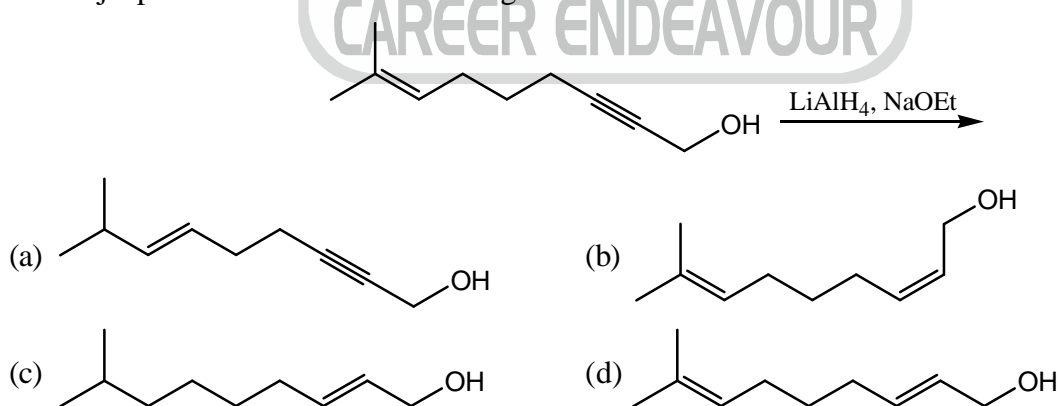
70. What is the likely product of the reaction shown?



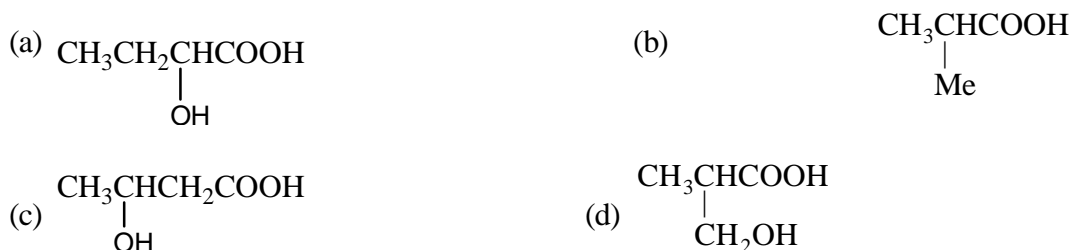
71. The major product formed in the following reaction



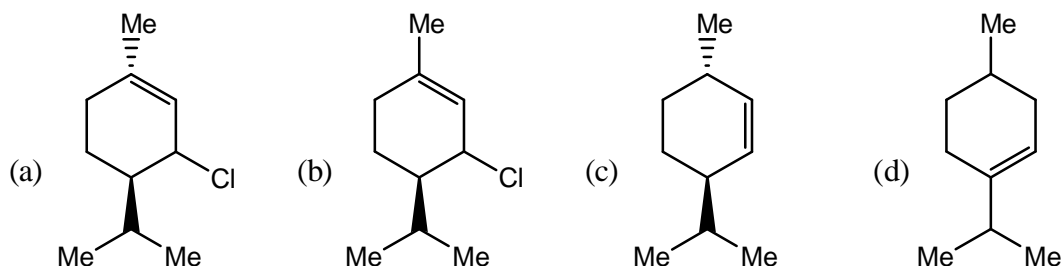
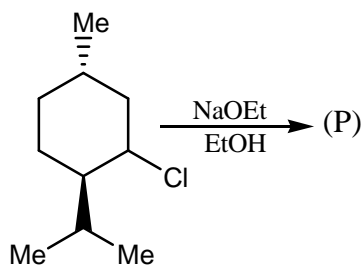
72. The major product formed in the following reaction:



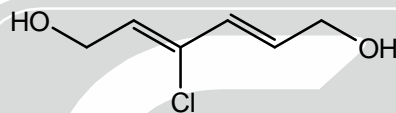
73. An optically active compound 'X' has molecular formula $C_4H_8O_3$. It evolves CO_2 with $NaHCO_3$. X reacts with $LiAlH_4$ to give achiral compounds 'X' is:



74. Which is product of the reaction:



75. The IUPAC name of the compound given below is



- (a) (2Z, 4Z)-3-chlorohexa-2, 4-diene-1, 6-diol.
 (b) (2E, 4E)-3-chlorohexa-2, 4-diene-1, 6-diol
 (c) (2Z, 4Z)-3-chlorohexa-2, 4-diene-1, 6-diol
 (d) (2Z, 4E)-3-chlorohexa-2, 4-diene-1, 6-diol,

76. Arrange the following in decreasing order of O–O Bond length?

- (i) O_2 (ii) O_2^+ (iii) O_2^{2-} (iv) O_3
 (a) iv > i > iii > ii (b) ii > i > iii > iv (c) i > iv > ii > iii (d) iii > iv > i > ii

77. PCl_5 does not react with

- (a) CH_3COOH (b) C_6H_5OH (c) C_2H_5OH (d) H_2SO_4

78. Partial pressure of CO_2 in a mixture of CO_2 and N_2 is 1 atm while the total pressure of mixture is 5 atm. Mole fraction of nitrogen in the mixture is

- (a) 0.65 (b) 0.8 (c) 0.75 (d) 0.82

79. pH of the solution produced by mixing equal volumes of $2.0 \times 10^{-3} M HClO_4$ and $1.0 \times 10^{-2} M KClO_4$ is

- (a) 2.3 (b) 1 (c) 3 (d) 2.7

80. For a simple paramagnetic compound, which one of the following is true?

- (a) Magnetic susceptibility decreases initially and then increases with decrease in temperature
 (b) Magnetic susceptibility decreases with decrease in temperature
 (c) Magnetic susceptibility increase with decrease in temperature
 (d) Magnetic susceptibility increases initially and then decreases with decrease in temperature

81. Two isotonic solutions will have same

- (a) Boiling point (b) Osmotic pressure (c) Vapour pressure (d) Freezing point

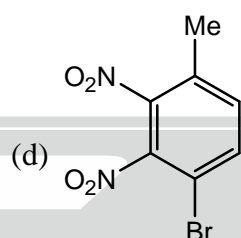
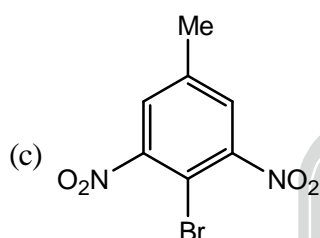
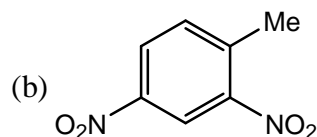
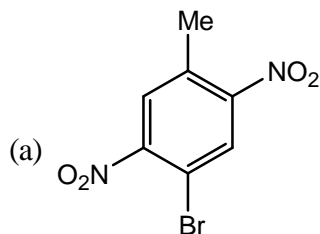
82. Melting points of the chlorides of alkali metals decreases in the order

- (a) $LiCl > NaCl > KCl > RbCl > CsCl$ (b) $LiCl > NaCl > KCl > RbCl > CsCl$
 (c) $LiCl > NaCl > KCl > RbCl > CsCl$ (d) $LiCl > NaCl > KCl > RbCl > CsCl$

83. Residual entropy is the entropy of

- (a) An isolated system (b) A system undergoing reversible reaction
 (c) A system at equilibrium (d) A system at absolute zero of temperature

84. Although carbon and oxygen are constituents of carbonate and oxalate, the reason behind oxalate being an interfering anion
- Higher oxidizability of oxalate than carbonate
 - Higher reducibility of oxalate than carbonate
 - Higher chelating ability of oxalate than carbonate
 - Higher polarisability of oxalate than carbonate
85. The major product formed in the dinitration of 4-bromotoluene is



86. Electronic spin has eigen value
- h
 - $h/4\pi$
 - $1/2h$
 - $1/h$
87. Which of the following shows Jahn-Teller Distortion?
- Co^{2+}
 - Mn^{2+}
 - All of these
 - Fe^{2+}
88. Which of the following is an incorrect representation of the order of a reaction:
- $\text{N}_2\text{O}_5(\text{g}) \longrightarrow 2\text{N}_2(\text{g}) + \frac{1}{2}\text{O}_2$ is a 1st order reaction
 - $2\text{CH}_3\text{CHO} \longrightarrow 2\text{CH}_4 + 2\text{CO}$ is a 2nd order reaction
 - None of these
 - $\text{S}_2\text{O}_8^{2-} + 2\text{I}^- \longrightarrow 2\text{SO}_4^{2-} + \text{I}_2$
89. Which of the following pair has the same electronic structure?
- Ag, Sn
 - Mg, Na^+
 - Ca, Ar
 - Ar, Cl^-
90. Which of the following is not a colligative property?
- Osmotic pressure
 - Relative increase in vapour pressure
 - Depression of freezing point
 - Elevation of boiling point
91. Which of the following statement is false?
- Oxidation reaction takes place at the cathode of a galvanic cell
 - The potential of normal hydrogen electrode (NHE) is assigned a value of zero volts
 - The EMF of a galvanic cell can be measured with a voltmeter
 - Oxidation reaction takes place at anode of a galvanic cell
92. Which one of the following is a superconductor?
- $\text{YB}_2\text{Cu}_3\text{O}_7$
 - $\text{YBe}_2\text{Cu}_3\text{O}_7$
 - $\text{YBi}_2\text{Cu}_3\text{O}_7$
 - $\text{YBa}_2\text{Cu}_3\text{O}_7$
93. Which one of the following plays a major role in EDTA complexometric titrations?
- Concentration of ligand
 - Concentration of metal ion
 - Temperature of the reaction
 - Nature of buffer
94. Pyrosilicates are the silicates in which the two tetrahedral units are linked at
- Three points
 - One point
 - Four points
 - Two points

95. In a face-centre cubic (FCC) type of crystal lattice, the number of atoms belonging exclusively to each unit cell within the lattice is/are :
(a) 4 (b) 2 (c) 3 (d) 1
96. Langmuir adsorption isotherm equation shows the variation of extent of adsorption as a function of
(a) pH of medium (b) Pressure (c) Temperature (d) All of these
97. According to Lambert-Beer's law, for a solution the transmittance is independent of which following factor?
(a) Molar extinction coefficient of the solute in solution
(b) Path length of the sample holder
(c) Concentration of the solution
(d) Temperature of the system
98. The compressibility factor for ideal gas is
(a) 1 (b) > 1 (c) Zero (d) < 1
99. The following compounds have been arranged in the order of increasing thermal stabilities. Identify the correct order K_2CO_3 (I), $MgCO_3$ (II), $CaCO_3$ (III), $BeCO_3$ (IV)
(a) $II < IV < III < I$ (b) $IV < II < I < III$ (c) $IV < II < III < I$ (d) $I < II < III < IV$
100. The covalent radius of Li is 123 pm. The crystal radius of Li will be
(a) $123/2$ pm (b) < 123 (c) $= 123$ (d) > 123 pm

