DU M.SC. ENTRANCE CHEMISTRY 2018

1. The halogen having metallic character is

(a) Bromine (b) Chlorine (c) Iodine (d) Fluorine

2. 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

3. 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

4. Which of the following species represent the example of dsp^2 hybridization?

(a) $[FeF_6]^{3-}$ (b) $[Fe(CN)_6]^{3-}$ (c) $[Ni(CN)_4]^{2-}$ (d) $[Zn(NH_3)_4]^{2+}$

5. 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 receptors

(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 hydrogen bond donor.

6. Chemical potential is also known as

(a) Partial molar entropy (b) Partial molar Gibbs free energy

(c) None of these (d) Partial molar enthalpy

7. From the following, which is more covalent?

(a) Al_2S_3 (b) AlN (c) Al_2Cl_6 (d) Al_2O_3

8. The most probable candidate to form an octahedral complex is

(a) d^{10} (b) $d^8(\text{high spin})$ (c) $d^8(\text{low spin})$ (d) $d^1(\text{low spin})$

9. Percentage of gold in 18 carat gold is

(a) 18 (b) 100 (c) 75 (d) 83.6

10. Which pair from the following behaves as metalloid?

(a) Al and Zn (b) Rb and Cs (c) Br and I (d) Pt and I

11. 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

12. 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) $La(OH)_3$ is less basic than $Lu(OH)_3$

(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) Radio frequency

(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) $mol^{-2}dm^{6}s^{-1}$ (c) $mol\,dm^{-3}s^{-1}$ (d) $mol^{-1}dm^{3}s^{-1}$

27. What is the unit of specific resistance (or resistivity) of a conductor?

(a) $Ohmcm^{-1}$ (b) $Siemens^{-1}$ (c) $Ohm^{-1}\,cm$ (d) $Siemens^{-1}\,cm$

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 B_2 (b) Vitamin B_1 (c) Vitamin B_6 (d) Vitamin B_{12}

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) Fe^{3+} (b) Cr^{3+} (c) Ni^{2+} (d) Co^{2+}

36. The Bragg's equation for crystallography can be written as

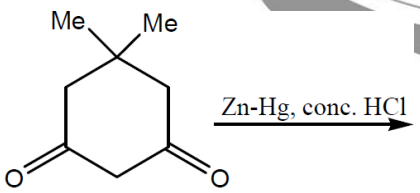
(a) $n\lambda = (2d/\sin\theta)$ (b) $n\lambda = (2d\sin\theta)$

(c) $n\lambda = (2/d)\sin 2\theta)$ (d) $n\lambda = 1/(2d\sin\theta)$

37. The product X in the flowing reaction $6LiH + 8BF_3 \longrightarrow 6LiBF_4 + X$ is

(a) B_4H_{10} (b) B_2H_6 (c) B_3H_8 (d) BH_3

38. The product obtained in the following conversion is



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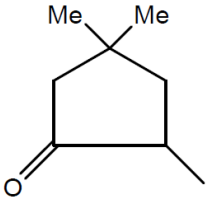

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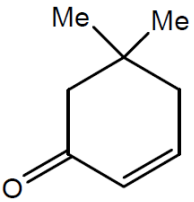
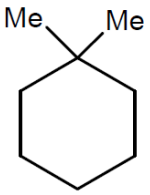
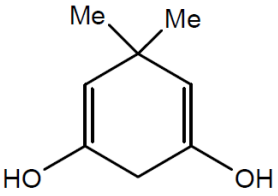
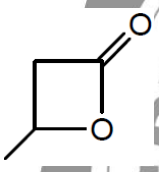
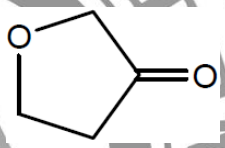


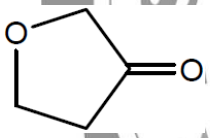
(c) 

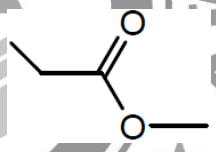
(d) 

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

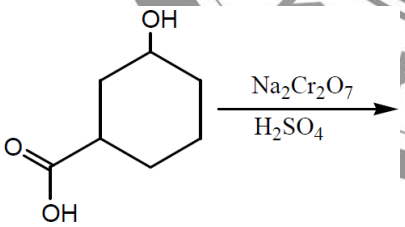
(a) 

(b) 

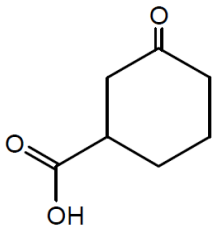
(c) 

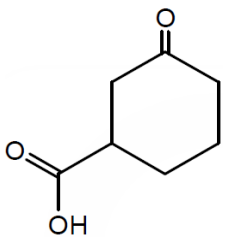
(d) 

40. The product in the given reaction is

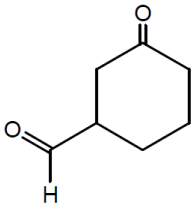


The product obtained is

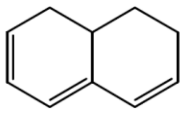
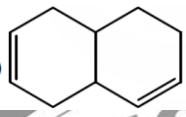
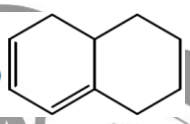
(a) 

(b) 

(c) None of these

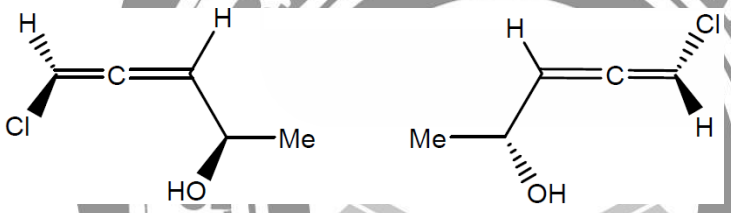
(d) 

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

(I)  (II)  (III) 

(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

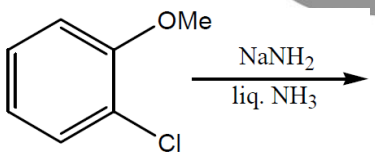
(c) constitutional isomers (d) diastereomers

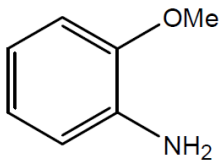
43. Tl^{+} compounds are poisonous because

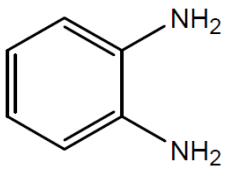
(a) stop blood circulation (b) they attack liver

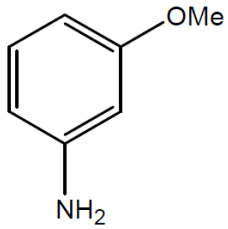
(c) cut-off breathing capability (d) they can cause blood infection

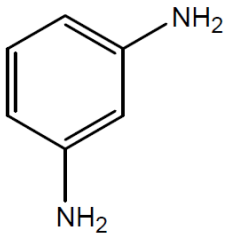
44. The major product formed in the following reaction is



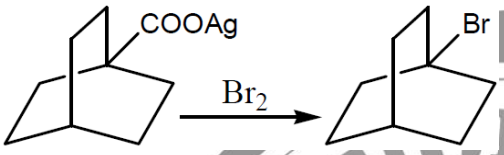
(a) 

(b) 

(c) 

(d) 

45. Following reaction goes through?



(a) carbine 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

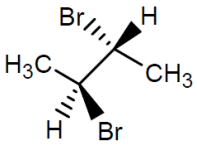
(c) The effective concentration of the reduced form is increased

(d) The reduction potential of the system is lowered

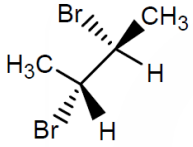
47. Total orbital angular momentum of np6 electronic system is (a.u.)

(a) 0 (b) ½ (c) 2 (d) 1

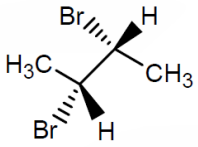
48. Identify the enantiomers among the following compounds



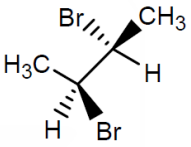
(A)



(B)



(C)



(D)

(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.

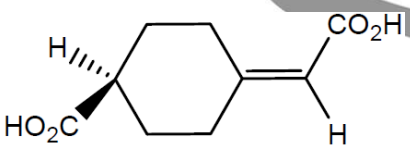
(a) A-4, B-3, C-1, D-2 (b) A-4, B-3, C-2, D-1

(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 O_2F_2 is

(a) +2 (b) +1 (c) +4 (d) –2

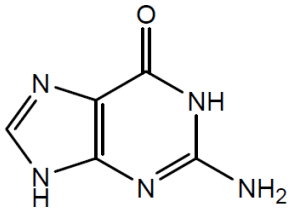
51. The following molecule has



(a) R-Configuration (b) Centre of symmetry

(c) S-configuration (d) Plane of symmetry

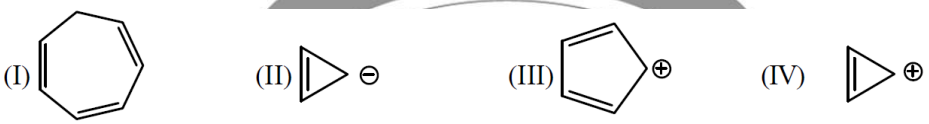
52. In low chloride ion concentration, the anticancer drug cis-plantin hydrolysis to give a diaqua complex and this binds to DNA via adjacent guanine.



The coordinating atom of guanine to $Pt(II)$ is

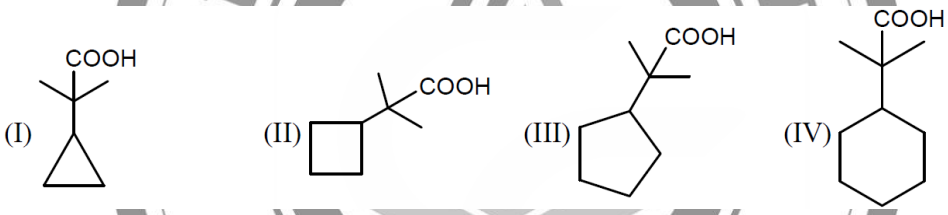
(a) N9 (b) N7 (c) N1 (d) N3

53. Which of the following species is aromatic in nature?



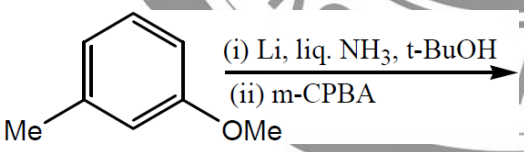
(a) IV (b) I (c) II (d) III

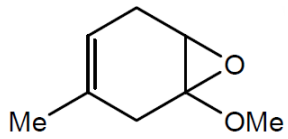
54. Arrange the following in decreasing order of their acidity

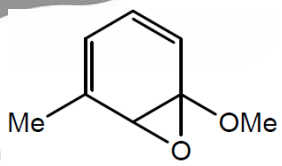


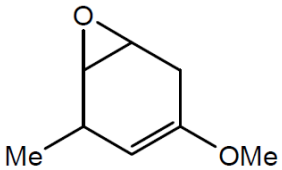
(a) IV > II > I > III (b) IV > III > II > I (c) I > II > III > IV (d) I > IV > III > II

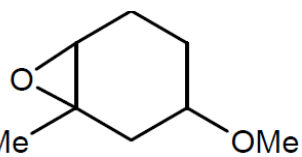
55. The major product formed in the following reaction sequence is



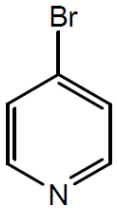
(a) 

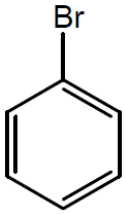
(b) 

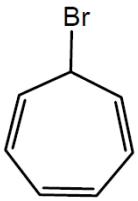
(c) 

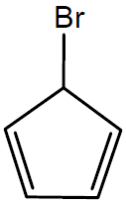
(d) 

56. The compound that gives precipitate on warming with aqueous $AgNO_3$ is

(a) 

(b) 

(c) 

(d) 

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?

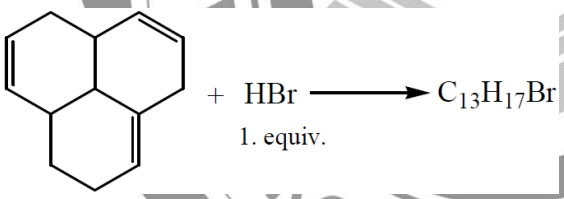
(a) 64 $Siemens^{-1}$ cm (b) 16 $Siemens^{-1}$ cm

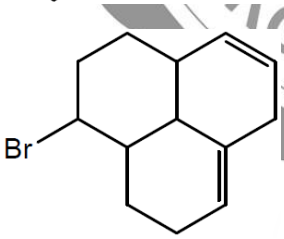
(c) 4 $Siemens^{-1}$ cm (d) 1 $Siemens^{-1}$ cm

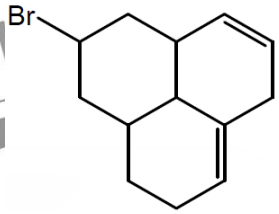
58. Which pair of ions cannot be precipitated by H_2S in dilute HCl?

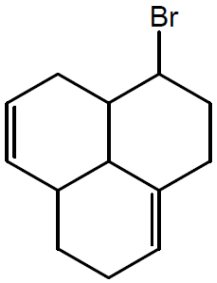
(a) Al^{3+}, Ni^{2+} (b) Bi^{3+}, Sn^{4+} (c) Ni^{2+}, Cu^{2+} (d) Zn^{2+}, Cu^{2+}

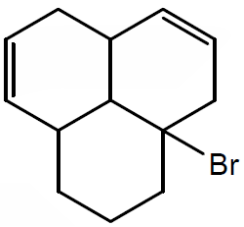
59. Which of the following bromides is the major product of the reaction shown below, assuming that there are no carbocation rearrangement?



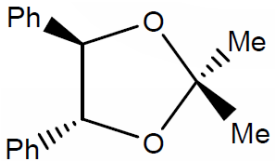
(a) 

(b) 

(c) 

(d) 

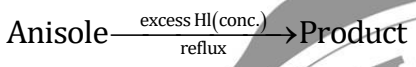
60. Methyl groups in the following compounds are

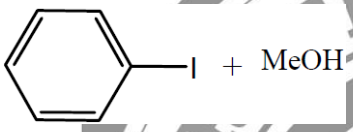


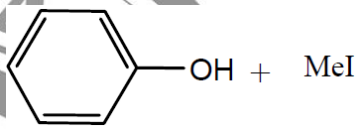
(a) homotopic (b) enantiotopic

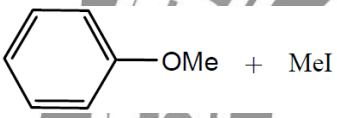
(c) constitutionally heterotopic (d) diasterotopic

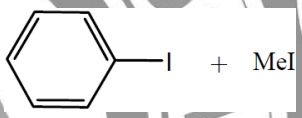
61. What is the principal product of the following reaction?



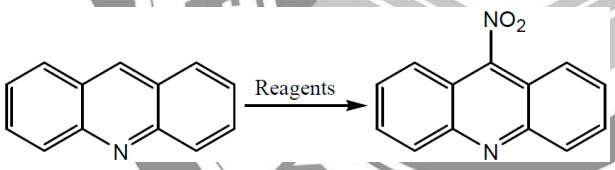
(a) 

(b) 

(c) 

(d) 

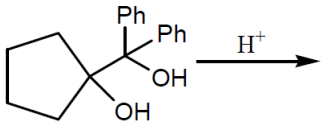
62. Provide the suitable reagents for this conversion:

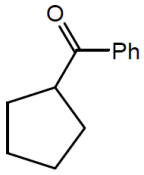


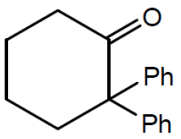
(a) m-CPBA, $HNO_3 / H_2SO_4 / PCl_3$ (b) $HNO_3 / H_2SO_4 / POCl_3$

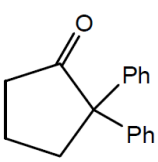
(c) $NaNO_2 / H_2SO_4 / PCl_3$ (d) $H_2O_2 / OH, HNO_3 / H_2SO_4 / PCl_3$

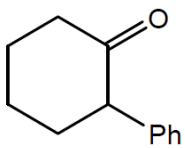
63. Identify the major product of the reaction?



(a) 

(b) 

(c) 

(d) 

64. In the reaction given below,

$$R-Cl \xrightarrow[(ii)\ LiAlH_4]{(i)\ KCN} \text{Product A}$$

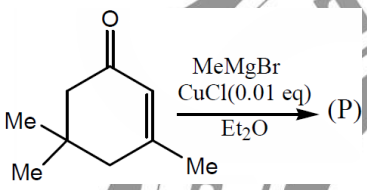
$$R-Cl \xrightarrow[(ii)\ LiAlH_4]{(i)\ AgCN} \text{Product B}$$

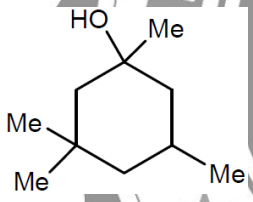
The compound A and B are:

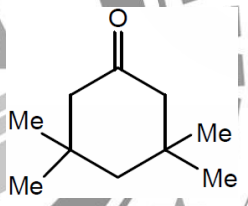
(a) Metamers (b) Functional isomers

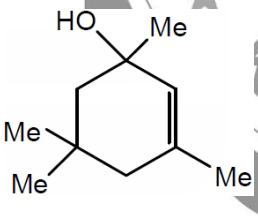
(c) Chain isomers (d) position isomers

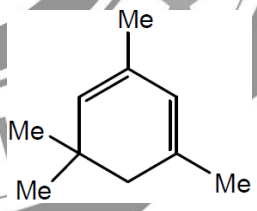
65. Which is product of the reaction



(a) 

(b) 

(c) 

(d) 

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}

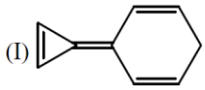
67. The molar weight of $MgCO_3$ is 84. The volume in litres of CO_2 at STP on heating 8.4 g of $MgCO_3$ would be

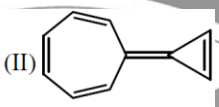
(a) 2.24 (b) 11.2 (c) 22.4 (d) 1.12

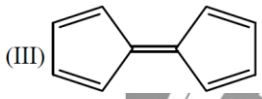
68. It takes 20 minutes for the concentration of a radioactive species to decay to its 1/4th value of its original concentration. What is the rate constant of this radioactive decay reaction?

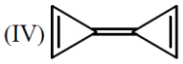
(a) $865.8\,s^{-1}$ (b) $600\,s^{-1}$ (c) $415.8\,s^{-1}$ (d) $0.001155\,s^{-1}$

69. Which of the following having the maximum Dipole moment?

(I) 

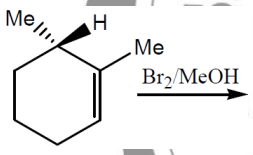
(II) 

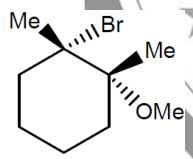
(III) 

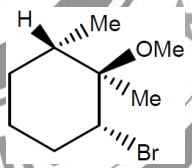
(IV) 

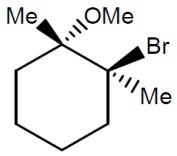
(a) I (b) II (c) III (d) IV

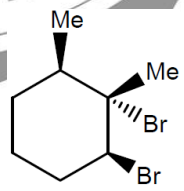
70. What is the likely product of the reaction shown?



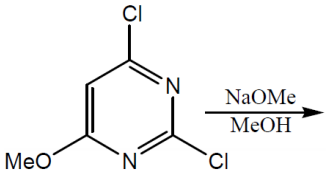
(a) 

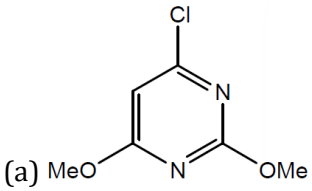
(b) 

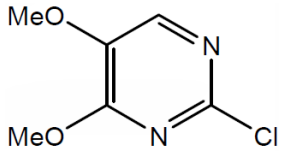
(c) 

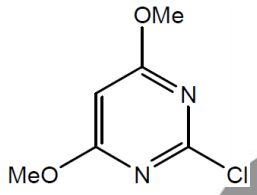
(d) 

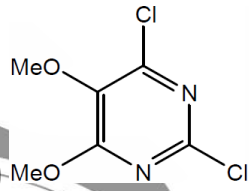
71. The major product formed in the following reaction



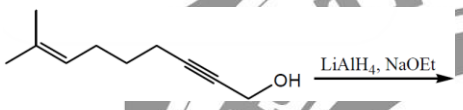
(a) 

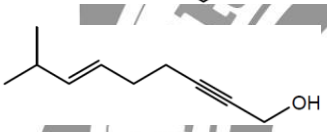
(b) 

(c) 

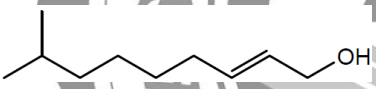
(d) 

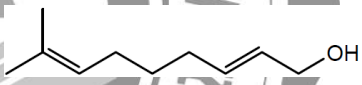
72. The major product formed in the following reaction:



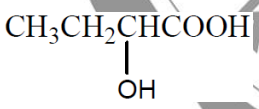
(a) 

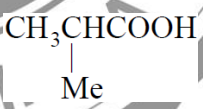
(b) 

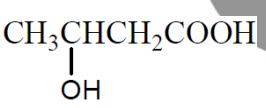
(c) 

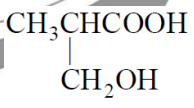
(d) 

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:

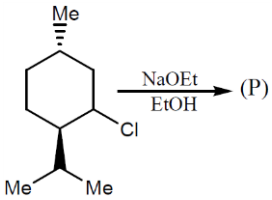
(a) 

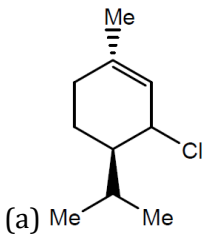
(b) 

(c) 

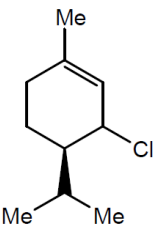
(d) 

74. Which is product of the reaction:

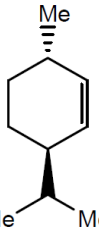




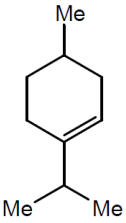
(a)



(b)

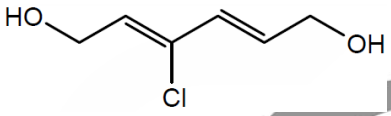


(c)



(d)

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) $(2E, 4Z)$-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 2.0×10^{-3} M $HClO_4$ and 1.0×10^{-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 increases with decrease in temperature

(d) Magnetic susceptibility increases initially and then decreaes 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 costituents of carbonate and oxalate, the reason behind oxalate being an interfering anion

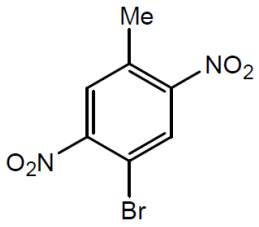
(a) Higher oxidizability of oxalate than carbonate

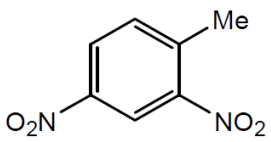
(b) Higher reducibility of oxalate than carbonate

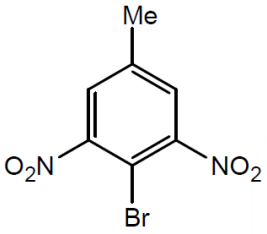
(c) Higher chealating ability of oxalate cthan carbonate

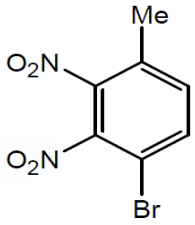
(d) Higher polarizability of oxalate than carbonate

85. The major product formed in the dinitration of 4-bromotoluene is

(a) 

(b) 

(c) 

(d) 

86. Electronic spin a has eigen value

(a) h (b) $h/4\pi$ (c) 1/2h (d) 1/h

87. Which of the following shows Jahn-Teller Distortion?

(a) Co^{2+} (b) Mn^{2+} (c) All of these (d) Fe^{2+}

88. Which of the following is an incorrect representation of the order of a reaction:

(a) $N_2O_5(g) \longrightarrow 2N_2(g) + \frac{1}{2}O_2$ is a 1st order reaction

(b) $2CH_3CHO \longrightarrow 2CH_4 + 2CO$ is a 2nd order reaction

(c) None of these

(d) $S_2O_8^{2-} + 2I^- \longrightarrow 2SO_4^{2-} + I_2$

89. Which of the following pair has the same electronic structure?

(a) Ag, Sn (b) Mg, Na^+ (c) Ca, Ar (d) Ar, Cl^-

90. Which of the following is not a colligative property?

(a) Osmotic pressure (b) Relative increase in vapour pressure

(c) Depression of freezing point (d) Elevation of boiling point

91. Which of the following statement is false?

(a) Oxidation reaction takes place at the cathode of a galvanic cell

(b) The potential of normal hydrogen electrode (NHE) is assigned a value of zero volts

(c) The EMF of a galvanic cell can be measured with a voltmeter

(d) Oxidation reaction takes place at anode of a galvanic cell

92. Which one of the following is a superconductor?

(a) $YB_2Cu_3O_7$ (b) $YBe_2Cu_3O_7$ (c) $YBi_2Cu_3O_7$ (d) $YBa_2Cu_3O_7$

93. Which one of the following plays a major role in EDTA complex-metric titrations?

(a) Concentration of ligand (b) Concentration of metal ion

(c) Temperature of the reaction (d) Nature of buffer

94. Pyrosilicates are the silicates in which the two tetrahedral units are linked at

(a) Three points (b) One point (c) Four points (d) 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

$\mathrm{K_2CO_3(I)},\quad \mathrm{MgCO_3(II)},\quad \mathrm{CaCO_3(III)},\quad \mathrm{BeCO_3(IV)}$

(a) $\mathrm{II < IV < III < I}$ (b) $\mathrm{IV < II < I < III}$ (c) $\mathrm{IV < II < III < I}$ (d) $\mathrm{I < II < III < IV}$

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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