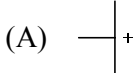
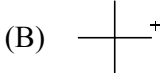
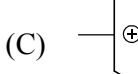
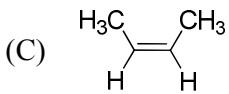


CHEMISTRY (PG)
(Final)

- The correct order of electronegativity of hybridized orbitals is
 (A) $sp > sp^2 > sp^3$ (B) $sp < sp^2 < sp^3$
 (C) $sp^3 > sp > sp^2$ (D) $sp^3 < sp < sp^2$
- The carbocation resulting from the heterocyclic cleavage of neopentyl chloride is
 (A)  (B) 
 (C)  (D) 
- Among the following, the set consisting of only electrophiles is
 (A) CH_3ONa , CH_3^+CO , $:\text{CCl}_2$
 (B) CH_3MgI , NH_3 , KOH
 (C) Ph^+CH_2 , BF_3 , $:\text{CCl}_2$
 (D) $:\text{CH}_2$, $^-\text{CCl}_3$, NaNH_2
- Which of the following has the lowest dipole moment?
 (A) $\text{CH}_2=\text{CH}-\text{C}\equiv\text{CH}$ (B) $\text{CH}_3-\text{CH}_2-\text{C}\equiv\text{CH}$
 (C)  (D) $\text{CH}_3-\text{C}\equiv\text{C}-\text{CH}_3$
- Which C-C single bond is shortest in length among the following?
 (A) CH_3-CN (B) $\text{CH}\equiv\text{C}-\text{CN}$
 (C) $\text{CH}_2=\text{CH}-\text{CN}$ (D) CH_3-CH_3
- The electron density at C_4 of toluene is greater than the electron density at C_4 of t-butylbenzene due to
 (i) Hyperconjugation (ii) Inductive effect
 (iii) No-bond resonance (iv) Baker-Nathan effect
 (A) (i), (iii), (iv) (B) (i), (ii), (iii)
 (C) (i), (ii) (D) (i)

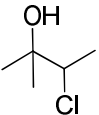
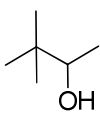
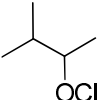
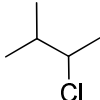
7. The increasing order of stability of following carbocations is



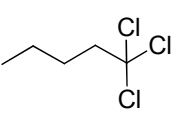
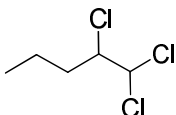
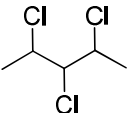
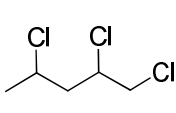
- (A) ii < iii < i < iv
(B) iii < ii < i < iv
(C) iv < ii < i < iii
(D) i < iii < ii < iv

8. The product of the following reaction is



- (A)  (B) 
(C)  (D) 

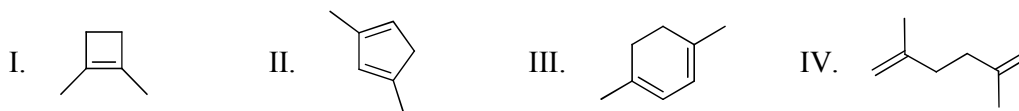
9. The compound (X) ($C_5H_9Cl_3$) on hydrolysis with aq. NaOH gives a product Y which on heating with sodalime gives an alkane (Z). The compound X is

- (A)  (B) 
(C)  (D) 

10. The repeated Hofmann exhaustive methylation of 3,5-dimethylpiperidine followed by the reaction with moist silver oxide and then heating to give an unsaturated hydrocarbon (X). The more stable unsaturated hydrocarbon X is

- (A) 2,4-Dimethyl-pent-1-ene
(B) 4-Methyl-hex-1,3-diene
(C) 2,4-Dimethyl-pent-1,3-diene
(D) 2,4-Dimethyl-pent-1,4-diene

11. The ozonolysis of hydrocarbon (A) gives 2,5-hexanedione as one of the products. Hydrocarbon (A) may be



- (A) I, II, III, IV
(B) I, II, III
(C) I, III, IV
(D) IV

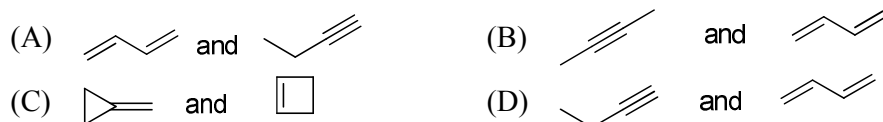
12. Kolbe's electrolysis of sodium salt of adipic acid results in the formation of
- (A) Butane (B) Cyclohexane
(C) Hexane (D) Cyclobutane
13. 2-Butyne on reduction with Na/liq. NH_3 followed by Diels-Alder reaction with butadiene gives



14. Which of the following alkenes will react fastest with H_2 under catalytic hydrogenation?



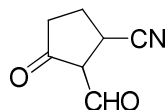
15. A hydrocarbon A contains 88.9% of C. It gives red ppt with ammoniacal cuprous chloride and its isomer B reacts with bromine to form 1,4-dibromo-2-butene. The compounds A and B respectively are



16. If the organic substance contains both nitrogen and sulphur, the SE gives blood red coloration with FeCl_3 . The blood red coloration is due to

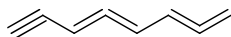


17. The IUPAC name for the following compound is



- (A) 2-Cyano-5-oxocyclopentanecarbaldehyde
(B) 3-Cyano-2-formylcyclopentan-1-one
(C) 2-Formyl-3-oxocyclopentanecarbonitrile
(D) 2,3-Dioxocyclopentanecarbonitrile

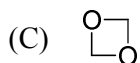
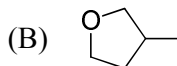
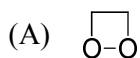
18. The number of sp-hybridised carbon atoms in the molecule



- (A) Two (B) Three
(C) Four (D) One
19. The compound with a degree of unsaturation of three has five carbon atoms, one nitrogen atom and one oxygen atom in a molecule. The number of hydrogen atoms per molecule is

- (A) 4 (B) 5
(C) 6 (D) 7

20. The acetal in the following is



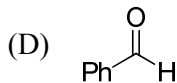
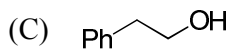
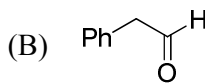
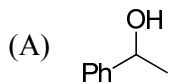
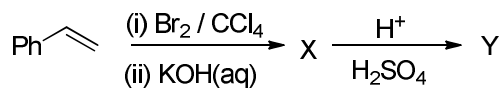
21. Alkanediones and alkanedials have the general formula

- (A) $C_nH_{2n}O$ (B) $C_nH_{2n}O_2$
(C) $C_nH_{2n-2}O_2$ (D) $C_nH_{2n+2}O_2$

22. Which of the following will give a satisfactory yield of ketone on reaction with a Grignard reagent and subsequent hydrolysis?

- (A) An aldehyde (B) A carboxylic acid
(C) An ester (D) A nitrile

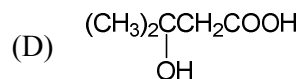
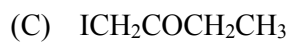
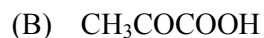
23. The product Y in the reaction is



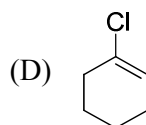
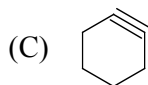
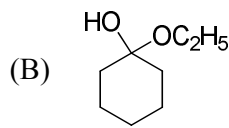
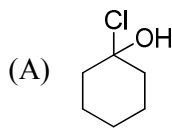
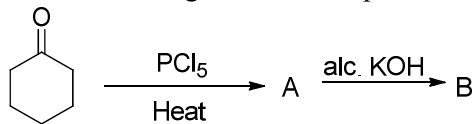
24. Active species in Fehling's solution is

- (A) Sodium ammonium tartrate (B) Cuprous ion
(C) Sulphate ion (D) Cupric ion

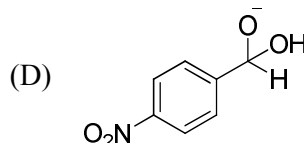
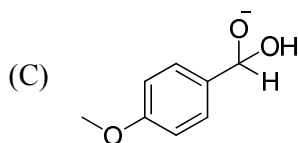
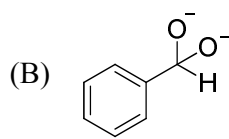
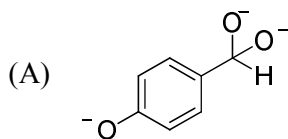
25. Which of the following will not respond positively to the iodoform test?



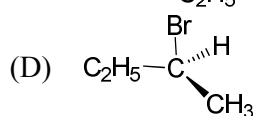
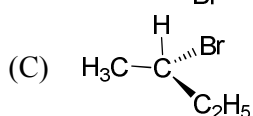
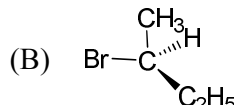
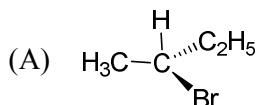
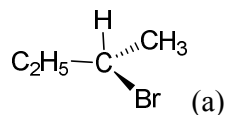
26. In the following reaction, the product B is mainly



27. In Cannizzaro's reaction, the intermediate that will be the best hydride donor is



28. Which of the following structures is enantiomeric with the molecule (a) given below?



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35. Which of the following reactions of glucose can be explained only by its cyclic structure?
- Glucose forms pentacetate
 - Glucose reacts with hydroxylamine to form an oxime
 - Pentacetate of glucose doesnot react with hydroxylamine
 - Glucose is oxidized by nitric acid to gluconic acid
36. In fibrous proteins, polypeptide chains are held together by
- Van der Waals forces
 - Disulphide linkage
 - Electrostatic forces of attraction
 - Hydrogen bonds
- (i), (ii), (iii)
 - (ii), (iv)
 - (i), (iv)
 - (i), (ii), (iii), (iv)
37. Which of the following are not used as food preservatives?
- Table salt
 - Sodium hydrogen carbonate
 - Cane sugar
 - Benzoic acid
- (i), (ii), (iii), (iv)
 - (i), (ii)
 - (i), (iii)
 - (i), (iv)
38. The component of blood which functions for blood clotting is
- Globulins
 - Albumins
 - Fibrinogen
 - WBC
39. Stephen reduction converts cyanides to
- Amines
 - Aldehydes
 - Ketones
 - Acids
40. Nitrous acid has no action on
- $C_6H_5CONH_2$
 - $CH_3CH_2NO_2$
 - $C_6H_5N(CH_3)_2$
 - CH_3CH_2COOH
41. The product of reaction of alcoholic silver nitrite with ethyl bromide is
- Ethane
 - Nitroethane
 - Ethyl nitrile
 - Ethyl isocyanide

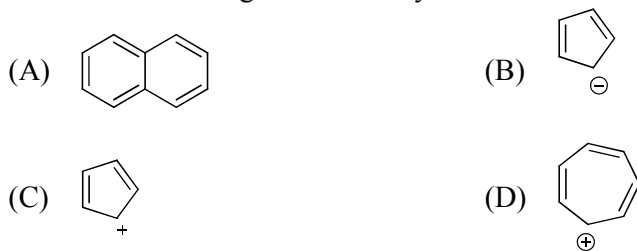
42. Compound $C_4H_{10}O$ reacts with sodium metal to liberate hydrogen gas. It does not react with bromine in CS_2 but produces immediate cloudiness with Lucas reagent. The compound

(A) n-butyl alcohol (B) sec-butyl alcohol
(C) iso-butyl alcohol (D) tert-butyl alcohol

43. Compound A $C_4H_8Cl_2$ is hydrolyzed to compound B, C_4H_8O which gives an oxime and a negative Tollen's test. The structure of A is

(A) $CH_3CH_2CH_2CHCl_2$ (B) $CH_3CH_2C(Cl)_2CH_3$
(C) $CH_3CH(Cl)CH(Cl)CH_3$ (D) $CH_3CH(Cl)CH_2CH_2Cl$

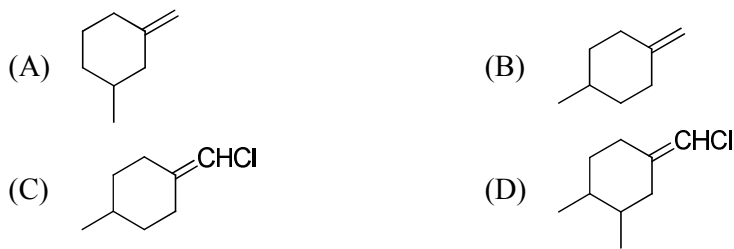
44. Which of the following does not obey Huckel rule?



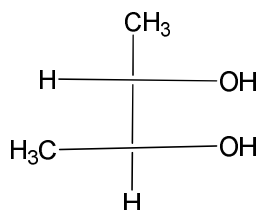
45. Glycerol on heating with excess of HI gives

(A) Allyl iodide (B) 1,2,3-triodopropane
(C) Propene (D) Isopropyl iodide

46. The geometrical isomerism is shown by



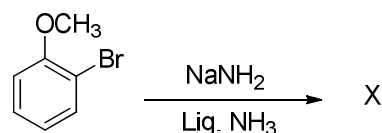
47. Correct configuration of the following is



(A) 1S, 2S (B) 1S, 2R
(C) 1R, 2S (D) 1R, 2R

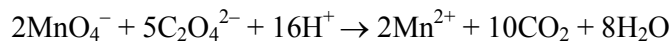
48. The secondary structure of a protein refers to
- α -helical backbone
 - Hydrophobic interactions
 - Sequence of α -amino acids
 - Fixed configuration of the polypeptide backbone
49. The relative resonance energies of thiophene, pyrrole and furan
- Furan > Pyrrole > Thiophene
 - Pyrrole > Furan > Thiophene
 - Thiophene > Pyrrole > Furan
 - Thiophene > Furan > Pyrrole

50. The major product X in the following reaction is



-
-
-
- Mixture of (A) and (B)

51. KMnO_4 reacts with oxalic acid according to the equation



So, 20 mL of 0.1 M KMnO_4 requires

- 20 mL of 0.1 M oxalic acid
 - 50 mL of 0.1 M oxalic acid
 - 20 mL of 0.5 M oxalic acid
 - 50 mL of 0.5 M oxalic acid
52. 2.5 g of an iron compound upon suitable treatment gave 0.358 g of ferric oxide. The percentage of iron in the compound is (Atomic masses: Fe = 55.85; O = 16)
- 10.01
 - 20.02
 - 15.01
 - 2.5
53. The amount (in grams) of potassium dichromate (MW = 294) present in 200 mL of 0.25M aqueous solution is
- 147
 - 14.7
 - 1.47
 - 0.147

54. Ilmenite, cassiterite and hematite are, respectively, the ores of
- (A) iron, tin and titanium (B) tin, titanium and iron
(C) titanium, iron and tin (D) titanium, tin and iron
55. An aqueous solution of a compound MCl_2 (where M is first row transition metal) produces bright red precipitate with ethanolic solution of dimethylglyoxime. The compound is
- (A) $FeCl_2$ (B) $CoCl_2$
(C) $NiCl_2$ (D) $CuCl_2$
56. From a solution mixture of Zn^{2+} , Cd^{2+} , Mn^{2+} and Hg^{2+} ions, H_2S in acidic medium will not precipitate
- (A) Hg^{2+} and Cd^{2+} (B) Mn^{2+} and Cd^{2+}
(C) Zn^{2+} and Cd^{2+} (D) Zn^{2+} and Mn^{2+}
57. Sodium salts of pseudohalogens, X and Y, give colourless solutions in water. Solution of X produces intense red colour with Fe^{3+} ions, while solution of Y gives intense blue colour with ferrous and ferric ion mixture. The pseudohalides X and Y are respectively
- (A) CN^- and SCN^- (B) N_3^- and SCN^-
(C) N_3^- and CN^- (D) SCN^- and CN^-
58. The molecular shapes of CF_4 and SF_4 are, respectively
- (A) tetrahedral and tetrahedral
(B) tetrahedral and square planar
(C) square planar and square planar
(D) tetrahedral and see-saw
59. The number of 90° and 180° F-P-F bonds in PF_5 are respectively
- (A) 6 and 1 (B) 6 and 2
(C) 3 and 1 (D) 1 and 1
60. Identify the pair which has the identical number of lone pairs
- (A) XeF_4 , ClF_3 (B) XeF_4 , XeO_2F_2
(C) XeO_4 , ICl_4^- (D) XeO_4 , ClF_3
61. Among $Ti(IV)$, $Cr(III)$, $Zn(II)$ and $Cu(II)$ ions, the species which have partially filled d-orbitals are
- (A) $Cr(III)$, $Zn(II)$ (B) $Ti(IV)$, $Zn(II)$
(C) $Cr(III)$, $Cu(II)$ (D) $Ti(IV)$, $Cu(II)$

62. Separation of lanthanide ions, Lu^{3+} , Yb^{3+} , Dy^{3+} and Eu^{3+} can be effected by using a cation exchange resin using an appropriate eluent. The order in which the ions will be separated is
- (A) Lu^{3+} , Yb^{3+} , Dy^{3+} , Eu^{3+} (B) Eu^{3+} , Dy^{3+} , Yb^{3+} , Lu^{3+}
 (C) Yb^{3+} , Dy^{3+} , Eu^{3+} , Lu^{3+} (D) Dy^{3+} , Yb^{3+} , Lu^{3+} , Eu^{3+}
63. The pair of lanthanides having the highest third ionization energy is
- (A) Eu, Gd (B) Eu, Yb
 (C) Dy, Yb (D) Yb, Lu
64. The order of Lewis acidity of boron halides is
- (A) $\text{BF}_3 < \text{BCl}_3 < \text{BBr}_3$ (B) $\text{BCl}_3 < \text{BF}_3 < \text{BBr}_3$
 (C) $\text{BBr}_3 < \text{BCl}_3 < \text{BF}_3$ (D) $\text{BF}_3 < \text{BBr}_3 < \text{BCl}_3$
65. The reaction of BCl_3 with NH_4Cl at 140°C followed by treatment with NaBH_4 gives
- (A) $\text{Cl}_3\text{B}_3\text{N}_3\text{H}_3$ (B) $\text{B}_3\text{N}_3\text{H}_6$
 (C) $\text{B}_3\text{N}_3\text{H}_3$ (D) $\text{B}_3\text{N}_3\text{H}_{12}$
66. In the following reactions
 (i) $\text{Cl}^- + n\text{H}_2\text{O} \rightarrow [\text{Cl}(\text{H}_2\text{O})_n]^-$
 (ii) $\text{Fe}^{2+} + 6\text{H}_2\text{O} \rightarrow [\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
 Water behaves as
- (A) an acid in both (i) and (ii)
 (B) a base in both (i) and (ii)
 (C) an acid in (i) and a base in (ii)
 (D) a base in (i) and an acid in (ii)
67. Ozone in the upper atmosphere protects life on earth
- (A) due to its diamagnetic nature
 (B) due to its blue colour
 (C) due to absorption of radiation of $\lambda = 255\text{ nm}$
 (D) by destroying chlorofluorocarbons
68. Identify the statement which is not true for diborane
- (A) It contains two bridging-and four terminal hydrogens
 (B) All the B-H bonds are of equal length
 (C) The bridging and terminal hydrogens are in mutually perpendicular plane
 (D) Diborane is very air sensitive

69. Metal-metal quadruple bonds are known to exist in
- (A) $\text{Fe}_3(\text{CO})_{12}$ (B) $\text{Co}_2(\text{CO})_8$
 (C) $\text{K}_2\text{Re}_2\text{Cl}_8$ (D) $\text{Cu}_2(\text{CH}_3\text{COO})_4$
70. The reactions of water with CaC_2 and Al_4C_3 yield
- (A) methane in both
 (B) ethyne in both
 (C) methane in the first and ethyne in the second
 (D) ethyne in the first and methane in the second
71. Among the pentahalides of group 15, the one which is unlikely to exist due to “inert pair” effect is
- (A) PCl_5 (B) AsCl_5
 (C) SbCl_5 (D) BiCl_5
72. The first ionization energy increases in the sequence
- (A) $\text{Be} < \text{B} < \text{C} < \text{N}$ (B) $\text{Be} > \text{B} < \text{C} < \text{N}$
 (C) $\text{Be} > \text{B} > \text{C} < \text{N}$ (D) $\text{Be} > \text{B} > \text{C} > \text{N}$
73. When a double bond is formed between two atoms, one of the bonds is a sigma bond and the other is a pi-bond. The pi-bond is created by the overlap of
- (A) sp^3 hybrid orbitals (B) sp^2 hybrid orbitals
 (C) sp hybrid orbitals (D) p-orbitals
74. Among the pairs of elements (i) Sc, Y, (ii) Zr, Hf (iii) La, Lu and (iv) Mo, W, the pairs having almost the same covalent radii are
- (A) (i), (ii) and (iii) (B) (i), (ii) and (iv)
 (C) (ii) and (iii) (D) (ii), and (iv)
75. The O–O stretching frequencies were observed at 810, 1100 and 1580 cm^{-1} for the three dioxygen species – O_2 , O_2^- and O_2^{2-} , but not necessarily in the same order. The correct correlation between them is
- (A) O_2 , 810; O_2^- , 1100; O_2^{2-} , 1580 (B) O_2 , 1100; O_2^- , 810; O_2^{2-} , 1580
 (C) O_2 , 1580; O_2^- , 1100; O_2^{2-} , 810 (D) O_2 , 810; O_2^- , 1580; O_2^{2-} , 1100
76. The magnetic properties of O_2 and O_2^{2-} are, respectively
- (A) paramagnetic and paramagnetic
 (B) diamagnetic and diamagnetic
 (C) diamagnetic and paramagnetic
 (D) paramagnetic and diamagnetic

77. The type of interaction that holds layers of graphite together is
- (A) covalent bonding (B) van der Waals forces
(C) hydrogen bonding (D) ionic bonding
78. Consider the following characteristics of the blue solution of sodium in liquid ammonia
(i) diamagnetic (ii) reducing in nature (iii) conducts electricity
- Which of them are true?
- (A) (i), (ii) and (iii) (B) (i) and (ii)
(C) (i) and (iii) (D) (ii) and (iii)
79. For tetrahedral complexes which always exhibit high spin states, the maximum CFSE is
- (A) $-8Dq$ (B) $-12 Dq$
(C) $-16Dq$ (D) $-6 Dq$
80. In general, the magnetic susceptibilities of paramagnetic complexes varies with temperature as
- (A) T^2 (B) T
(C) T^{-2} (D) T^{-1}
81. The structures of the complexes, $[\text{Cu}(\text{NH}_3)_4](\text{ClO}_4)_2$ and $[\text{Cu}(\text{NH}_3)_4](\text{ClO}_4)$ are, respectively
- (A) square planar and tetrahedral
(B) square planar and square planar
(C) octahedral and square pyramidal
(D) octahedral and trigonal bipyramidal
82. The d-electron configuration of $[\text{Fe}(\text{CN})_6]^{3-}$ ion and its magnetic moment in B.M. are
- (A) d^5 and $\sqrt{5(5+2)}$ (B) d^5 and $\sqrt{1(1+2)}$
(C) d^5 and $\sqrt{5(5+1)}$ (D) d^5 and $\sqrt{1(1+1)}$
83. Among $\text{V}(\text{CO})_6$, $\text{Cr}(\text{CO})_6$, $\text{Fe}(\text{CO})_5$ and $\text{Ni}(\text{CO})_4$, the compounds which obey EAN rule are
- (A) $\text{V}(\text{CO})_6$, $\text{Cr}(\text{CO})_6$ and $\text{Fe}(\text{CO})_5$ (B) $\text{V}(\text{CO})_6$, $\text{Fe}(\text{CO})_5$ and $\text{Ni}(\text{CO})_4$
(C) $\text{Cr}(\text{CO})_6$, $\text{Fe}(\text{CO})_5$ and $\text{Ni}(\text{CO})_4$ (D) only $\text{V}(\text{CO})_6$ and $\text{Cr}(\text{CO})_6$
84. In the compounds, $\text{MeCo}(\text{CO})_4$ and $\text{NaCo}(\text{CO})_4$, the formal oxidation number and the coordination number of Co are respectively:
- (A) +1, 5 and +1, 5 (B) +1, 4 and +1, 4
(C) +1, 5 and -1, 4 (D) -1, 5 and +1, 4

85. The true statement about $[\text{Cu}(\text{NH}_3)_6]^{2+}$ ion is
- all the Cu-N distances are equal
 - all the Cu-N distances are unequal
 - the equatorial bonds are longer than the axial bonds
 - the equatorial bonds are shorter than the axial bonds
86. The octahedral crystal field splitting (Δ_o) of d orbital energies of the following metal ions decreases in the order
- $\text{Co}^{2+} > \text{Co}^{3+} > \text{Rh}^{3+}$
 - $\text{Rh}^{3+} > \text{Co}^{3+} > \text{Co}^{2+}$
 - $\text{Rh}^{3+} > \text{Co}^{2+} > \text{Co}^{3+}$
 - $\text{Co}^{3+} > \text{Co}^{2+} > \text{Rh}^{3+}$
87. Ignoring the pairing energy, the CFSE of an octahedral high spin Co^{2+} complex is
- $-20Dq$
 - $+20Dq$
 - $+8Dq$
 - $-8Dq$
88. The crystal field splitting energy Δ_o and pairing energy, P values (in cm^{-1}) of octahedral energy complexes of Fe^{2+} are : $\Delta_o = 10400$ for 6 H_2O and 33000 for 6 CN^- ; $P = 17600$.
Then the spin states of the complexes would be
- both high spin
 - both low spin
 - high spin aqua complex and low spin cyanido complex
 - low spin aqua complex and high spin cyanido complex
89. $\text{Ni}^{2+}(\text{aq}) + 3 \text{en}(\text{aq}) \rightleftharpoons [\text{Ni}(\text{en})_3]^{2+}(\text{aq})$
 $\text{Ni}^{2+}(\text{aq}) + 6 \text{NH}_3(\text{aq}) \rightleftharpoons [\text{Ni}(\text{NH}_3)_6]^{2+}(\text{aq})$
 The equilibrium constant for the formation of $[\text{Ni}(\text{en})_3]^{2+}(\text{aq})$ (where en = ethylenediamine) is about 10^{10} times higher than that for $[\text{Ni}(\text{NH}_3)_6]^{2+}(\text{aq})$. The primary explanation for this large difference is
- Jahn-Teller effect
 - Macrocyclic effect
 - Chelate effect
 - Crystal field effect
90. Among CN^- , Cl^- , CO and CH_3^- , the ligand with only sigma bonding character is
- CN^-
 - Cl^-
 - CO
 - CH_3^-
91. Consider the complexes, $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$ and $[\text{Co}(\text{NH}_3)_5(\text{ONO})]\text{Cl}_2$. The type of isomerism exhibited by the complexes is
- coordination isomerism
 - ionization isomerism
 - linkage isomerism
 - optical isomerism

92. An Au-Cu alloys crystallizes in a cubic lattice with gold atoms occupying the corners of the cube and the copper atoms at the centers of the cubic faces. The empirical formula of the alloy is
- (A) Au_8Cu_6 (B) AuCu_3
(C) Au_2Cu_3 (D) Au_3Cu
93. The lattice energies of potassium halides follow the order
- (A) $\text{KF} < \text{KCl} < \text{KBr} < \text{KI}$ (B) $\text{KI} < \text{KCl} < \text{KF} < \text{KBr}$
(C) $\text{KF} < \text{KBr} < \text{KCl} < \text{KI}$ (D) $\text{KI} < \text{KBr} < \text{KCl} < \text{KF}$
94. Band theory predicts magnesium to be an insulator, but in practice it is a good conductor. This is due to
- (A) presence of filled 3s orbital
(B) overlap of filled 2p and filled 3s orbitals
(C) overlap of filled 3s and empty 3p orbital
(D) presence of unfilled 3p orbital
95. The electrical conductivity of a metal
- (A) increases with increasing temperature
(B) decreases with increasing temperature
(C) is independent of temperature
(D) shows oscillatory behaviour with temperature
96. In 'carbon-dating' applications of radioisotopes, ^{14}C emits
- (A) α particle (B) β particle
(C) γ radiation (D) positrons
97. A β -particle followed by an α -particle emission from $^{214}_{83}\text{Bi}$, the number of neutrons present in the daughter nucleus is
- (A) 130 (B) 128
(C) 127 (D) 129
98. The correct set of biologically essential elements is
- (A) Fe, Cu, Zn, Ag (B) Fe, Cu, Zn, Mg
(C) Cu, Mn, Co, Pt (D) Mg, Fe, Co, Ti
99. The enzyme involved in hydration of metabolic carbon dioxide and the metal present in it are
- (A) cytochrome c, Fe (B) hemocyanin, Cu
(C) carboxypeptidase, Zn (D) carbonic anhydrase, Zn

100. Redox enzymes involve metal ions which could exist in two different stable oxidation states. Which of the following is likely to be found in the redox enzyme systems?

- (A) Ca, Zn (B) Na, Mg
(C) Al, Ga (D) Cu, Fe

101. The total number of fundamental movements for a molecule consisting of n atoms

- (A) $3n + 6$ (B) $3n - 5$
(C) $3n$ (D) $3n + 5$

102. $C_2^2 = ?$

- (A) E (B) C_2
(C) σ_v (D) $\sigma_v \sigma_v'$

103. Principal axis means

- (A) X axis
(B) Z axis
(C) The rotational axis with the highest order
(D) Y axis

104. The order of the point group C_2 is

- (A) 2 (B) 0
(C) 1 (D) 3

105. Choose the molecule not belonging to point group $C_{\infty v}$

- (A) HCl (B) OCS
(C) HCN (D) CO_2

106. Match the following

<u>Molecule</u>	<u>Point group</u>
(I) CH_3Cl	(i) $D_{\infty h}$
(II) H_2O	(ii) $C_{\infty v}$
(III) H_2	(iii) C_{2v}
(IV) HCl	(iv) C_{3v}

- (A) (I) – (iv), (II) – (iii), (III) – (i), (IV) – (ii)
(B) (I) – (iii), (II) – (ii), (III) – (i), (IV) – (iv)
(C) (I) – (iv), (II) – (iii), (III) – (ii), (IV) – (i)
(D) (I) – (ii), (II) – (iii), (III) – (iv), (IV) – (i)

107. Match the following

<u>Region</u>	<u>$\lambda(\text{nm})$</u>
(I) UV	(i) 10^{11}
(II) Visible	(ii) 1,000 – 10, 000
(III) IR	(iii) 400 - 700
(IV) Radiowave	(iv) 200 – 350
(A) (I) – (ii), (II) – (I), (III) – (iv), (IV) – (iii)	
(B) (I) – (iv), (II) – (iii), (III) – (ii), (IV) – (i)	
(C) (I) – (i), (II) – (iv), (III) – (ii), (IV) – (iii)	
(D) (I) – (iii), (II) – (ii), (III) – (iv), (IV) – (i)	

108. Unit of reaction rate constant, k for a zero order reaction

- | | |
|-------------------------------------|--|
| (A) $\text{dm}^3 \text{mol s}^{-1}$ | (B) s^{-1} |
| (C) $\text{dm}^3 \text{mol}^{-1}$ | (D) $\text{dm}^{-3} \cdot \text{mol s}^{-1}$ |

109. A harmonic oscillator obeys

- | | |
|------------------|---------------------------------|
| (A) Hooke's law | (B) Boyle's law |
| (C) Dalton's law | (D) First law of thermodynamics |

110. If any two rows or columns are the same, the value of the determinant is

- | | |
|---------|----------|
| (A) One | (B) Zero |
| (C) Two | (D) Half |

111. CH_4 belongs to the point group

- | | |
|--------------|--------------|
| (A) T_d | (B) D_{2d} |
| (C) C_{3v} | (D) C_{2h} |

112. The number of translational, rotational and vibrational degrees of freedom of HCl are respectively

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

113. The selection rule in the rigid-rotator approximation is

- | | |
|------------------------|------------------------|
| (A) $\Delta J = \pm 1$ | (B) $\Delta J = + 2$ |
| (C) $\Delta J = 0$ | (D) $\Delta J = \pm 2$ |

114. In the Beer – Lambert law, $A = \ln \frac{I_0}{I} = Kcl$. The units of K are

- | | |
|-----------------------|--|
| (A) m^2 | (B) $\text{m}^2 \cdot \text{mol}^{-1}$ |
| (C) mol^{-1} | (D) Dimensionless |

115. Triple point of water

- (A) 273.16 K (B) 760 K
(C) 0 K (D) 100 K

116. Spherical top molecule

- (A) $I_A = I_B = I_C$ (B) $I_A \neq I_B \neq I_C$
(C) $I_B = I_C \neq I_A$ (D) $I_B \neq I_A = I_C$

117. Which is used as a catalyst for the hydrogenation of oils?

- (A) Ni (B) ZnO
(C) C (D) H_2SO_4

118. Choose the polar molecule(s)

- (I) OCS (II) H_2O (III) CO_2 (IV) N_2
(A) (I) and (II) (B) (III) and (IV)
(C) (III) only (D) (IV) only

119. Choose the molecule not having center of inversion

- (A) CO_2 (B) Benzene
(C) Regular octahedron (D) H_2O

120. de Broglie relation is

- (A) $p = \frac{h}{\lambda}$ (B) $p = \frac{h}{2\pi}$
(C) $p = h\lambda$ (D) $p = \frac{\lambda}{h}$

where p is the linear momentum

121. Match the following

Quantum number

Function

- | | |
|----------------|--|
| (I) Principal | (i) Governs the axial angular momentum of the electron |
| (II) Orbital | (ii) Governs the direction of an orbital |
| (III) Magnetic | (iii) Governs the shape of an orbital |
| (IV) Spin | (iv) Governs the energy of the orbital |

- (A) (I) – (iv), (II) – (iii), (III) – (ii), (IV) – (i)
(B) (I) – (iv), (II) – (i), (III) – (ii), (IV) – (iii)
(C) (I) – (ii), (II) – (iii), (III) – (iv), (IV) – (i)
(D) (I) – (iii), (II) – (i), (III) – (iv), (IV) – (ii)

122. Match the following

Characteristic Properties

- (I) Electrical resistance
(II) Electrical charge
(III) Rate of the reaction
(IV) Radioactivity

Instrumental Method

- (i) Isotope dilution method
(ii) Kinetic method
(iii) Coulometry
(iv) Conductometry

- (A) (I) – (iv), (II) – (iii), (III) – (ii), (IV) – (i)
(B) (I) – (iii), (II) – (i), (III) – (iv), (IV) – (ii)
(C) (I) – (ii), (II) – (iii), (III) – (iv), (IV) – (i)
(D) (I) – (iv), (II) – (ii), (III) – (i), (IV) – (iii)

123. Molar absorptivity is defined as

(A) $\frac{A}{bc}$

(B) Abc

(C) $\frac{1}{T}$

(D) $\frac{bc}{A}$

where A is absorbance, T is transmittance, b is path length and c is concentration

124. If the absorbance is 0.0510, then the percent transmittance is equal to

- (A) 51 %
(C) 88.9 %

- (B) 11.1 %
(D) 9.45 %

125. C = O Stretching frequency region is

- (A) $1640 - 1780 \text{ cm}^{-1}$
(C) $1350 - 1420 \text{ cm}^{-1}$

- (B) $2850 - 2960 \text{ cm}^{-1}$
(D) $3590 - 3650 \text{ cm}^{-1}$

126. For a spontaneous reaction, ΔG must be

- (A) Negative
(C) Zero

- (B) Positive
(D) Infinity

127. Choose the isotopes suitable for Mossbauer work

- (I) ^{57}F (II) ^{119}Sn (III) ^{129}I (IV) ^{99}Ru

- (A) I and II only
(C) None

- (B) All the four
(D) IV only

128. For an adiabatic change ΔS_{sur} is equal to

- (A) 0
(C) ∞

- (B) <1
(D) >1

129. Ice has a residual entropy of $\text{JK}^{-1} \text{mol}^{-1}$
- (A) 15 (B) 1.0
(C) 0 (D) 100
130. Number of vibrational degrees of freedom for a methane molecule
- (A) 10 (B) 9
(C) 15 (D) 1
131. What is the zero-point energy of simple harmonic oscillator?
- (A) $\frac{1}{2} \omega_{\text{osc}}$ (B) ω_{osc}
(C) $\frac{3}{2} \omega_{\text{osc}}$ (D) Zero
132. Number of infrared active normal modes of CO_2
- (A) 2 (B) 3
(C) 1 (D) None of the above
133. Choose the molecule(s) showing rotational Raman spectrum
- (I) CH_4 (II) SF_6 (III) $\text{CH}_3 - \text{CH}_3$ (IV) HCl
- (A) (III) and (IV) (B) (I) and (II)
(C) (I) only (D) (II) only
134. An orthorhombic cell has the parameters, $a = 0.82 \text{ nm}$, $b = 0.94 \text{ nm}$, $c = 0.75 \text{ nm}$. The spacing of the (123) plane is
- (A) 2.1 nm (B) 0.21 nm
(C) 0.11 nm (D) 0.44 nm
135. Which of the following is known as dry ice?
- (A) Solid CO_2 (B) Charcoal
(C) NH_3 (D) H_2O_2
136. The root-mean-square velocity (RMS) is given as
- (A) $3kT$ (B) $3kT_m$
(C) $\left\{ \frac{3kT}{m} \right\}^{1/2}$ (D) $\frac{m}{3kT}$

137. region is the spectral region of rotation of polyatomic molecules.
- (A) Visible (B) UV
(C) Microwave (D) IR
138. If number of protons and number of neutrons are even, then the nuclear spin quantum number, I is equal to
- (A) 0 (B) 1
(C) 2 (D) 3
139. Bucky ball is
- (A) Pb (B) C_{60}
(C) ^{13}C (D) CH_4
140. First one to use the term nanotechnology
- (A) Sumio (B) Pauling
(C) Nario Taniguchi (D) Curie
141. Number of significant figures in 0.0025
- (A) 2 (B) 3
(C) 4 (D) 1
142. The energy of a particle in a cubical box of length 'a' is given as $\frac{14h^2}{8ma^2}$. The degeneracy associated with the level is
- (A) 1 (B) 2
(C) 3 (D) 6
143. The number of radial nodes for 4f atomic orbital is
- (A) 0 (B) 1
(C) 2 (D) 3
144. Which of the following properties does not depend on zeta potential?
- (A) Electro osmosis (B) Electro phoresis
(C) Sedimentation (D) Donnan membrane equilibrium
145. Which of the following isotherms deals with multilayer adsorption?
- (A) Gibbs (B) Langmuir
(C) BET (D) Freundlich

146. Unimolecular surface catalysed gas phase reactions follow
- (A) first order kinetics at all pressures
 - (B) first order kinetics at low pressures and zero order kinetics at high pressures
 - (C) zero order kinetics at all pressures
 - (D) zero order kinetics at low pressures and first order kinetics at high pressures
147. The absorbance of a solution is 1.0 at 540 nm. What percentage of radiation is absorbed by the solution?
- (A) 10
 - (B) 50
 - (C) 90
 - (D) 100
148. An aqueous solution of CuSO_4 is electrolysed between 2 Pt electrodes. The reaction at anode is
- (A) oxidation of Cu
 - (B) oxidation of H_2O
 - (C) oxidation of sulphate ion
 - (D) oxidation of H_2
149. In Raman spectroscopy the radiation that is analysed is
- (A) scattered
 - (B) reflected
 - (C) transmitted
 - (D) incident
150. Which of the following statements is not true?
- (A) Specific conductance increases with concentration of a strong electrolyte
 - (B) Equivalent conductance increases with concentration of a strong electrolyte
 - (C) Equivalent conductance decreases with concentration of a strong electrolyte
 - (D) Equivalent conductance depends on ionic mobility
