CHEMISTRY

1. Which of the following metals is/are in liquid state below 30°C?

i. Mercury ii. Gallium iii. Rubidium iv. Cesium

|  |  |
| --- | --- |
| (A) | i only |
| (B) | i and ii |
| (C) | i and iii |
| (D) | i, ii and iv |

2. The names “Chalcogens” and “Pnictogens” represent

|  |  |
| --- | --- |
| (A) | Group 14 and Group 15 elements respectively |
| (B) | Group 16 and Group 15 elements respectively |
| (C) | Group 15 and Group 14 elements respectively |
| (D) | Group 15 and Group 16 elements respectively |

3. The name ‘coinage metals’ denotes which of the following group of metals?

|  |  |
| --- | --- |
| (A) | Cu and Fe |
| (B) | Cu and Ag |
| (C) | Cu, Ag and Fe |
| (D) | Cu, Ag and Au |

4. The only radioactive element in the lanthanide series is

|  |  |
| --- | --- |
| (A) | Lanthanum |
| (B) | Promethium |
| (C) | Gadolinium |
| (D) | Samarium |

5. Among the fluorides of alkali metals, the lowest solubility of LiF in water is due to the

|  |  |
| --- | --- |
| (A) | ionic nature of lithium fluoride |
| (B) | high lattice enthalpy |
| (C) | high hydration enthalpy for lithium ion |
| (D) | low ionisation enthalpy of lithium atom |

6. Which of the following properties are the special characteristics of alkali metals?

|  |  |
| --- | --- |
| (i) | High boiling point |
| (ii) | High negative standard electrode potential |
| (iii) | High density |
| (iv) | Large atomic size |

|  |  |
| --- | --- |
| (A) | i and ii |
| (B) | i and iv |
| (C) | ii and iv |
| (D) | iii and ii |

7. Which of the following compounds are readily soluble in water?

(i) BeSO4 (ii) MgSO4 (iii) BaSO4 (iv) SrSO4

|  |  |
| --- | --- |
| (A) | (i) and (ii) |
| (B) | (iii) and (iv) |
| (C) | (ii) and (iv) |
| (D) | (i) and (iv) |

8. Find the correct formula of halides of alkaline earth metals from the following.

|  |  |
| --- | --- |
| (i) | BaCl2.2H2O |
| (ii) | BaCl2.4H2O |
| (iii) | CaCl2.6H2O |
| (iv) | SrCl2.4H2O |

|  |  |
| --- | --- |
| (A) | (ii) and (iii) |
| (B) | (iv) and (ii) |
| (C) | (iv) and (i) |
| (D) | (i) and (iii) |

9. Match the correct pairs:

|  |  |  |  |
| --- | --- | --- | --- |
| **Elements** | | **Properties** | |
| (i) | Li | (a) | Insoluble sulphate |
| (ii) | Na | (b) | Strongest monoacidic base |
| (iii) | Ca | (c) | Most negative E**–** value among alkali metals |
| (iv) | Ba | (d) | Insoluble oxalate |

|  |  |
| --- | --- |
| (A) | (i) - (b); (ii) - (c); (iii) - (d); (iv) - (a) |
| (B) | (i) - (c); (ii) - (b); (iii) - (d); (iv) - (a) |
| (C) | (i) - (b); (ii) - (c); (iii) - (a); (iv) - (d) |
| (D) | (i) - (c); (ii) - (b); (iii) - (a); (iv) - (d) |

10. Match the following pairs.

|  |  |  |  |
| --- | --- | --- | --- |
| **Elements** | | **Colour they impart to the flame** | |
| (i) | Cs | (a) | Apple green |
| (ii) | Ca | (b) | Brick red |
| (iii) | Sr | (c) | Crimson red |
| (iv) | Ba | (d) | Blue |

|  |  |
| --- | --- |
| (A) | (i) - (c); (ii) - (a); (iii) - (d); (iv) - (b) |
| (B) | (i) - (a); (ii) - (c); (iii) - (b); (iv) - (d) |
| (C) | (i) - (b); (ii) - (d); (iii) - (a); (iv) - (c) |
| (D) | (i) - (d); (ii) - (b); (iii) - (c); (iv) - (a) |

11. A dehydrating agent commonly used in the laboratory is

|  |  |
| --- | --- |
| (A) | MgCO3 |
| (B) | CaF2 |
| (C) | CaCl2 |
| (D) | MgF |

12. The correct sequence of the increasing basic nature of the given oxides is

|  |  |
| --- | --- |
| (A) | K2O < Na2O < Al2O3 < MgO |
| (B) | Al2O3 < MgO < Na2O < K2O |
| (C) | MgO < K2O < Al2O3 < Na2O |
| (D) | MgO < K2O < Na2O < Al2O3 |

13. Which alkali metal does possess the highest ionization potential?

|  |  |
| --- | --- |
| (A) | Na |
| (B) | Li |
| (C) | Rb |
| (D) | Cs |

14. Alkali and alkaline earth metals exhibit coloured flame when heated over burner, which is due to

|  |  |
| --- | --- |
| (A) | smaller electronegativity of alkali metals |
| (B) | smaller ionic radius of these metals |
| (C) | de-excitation of electrons from higher energy levels to lower energy level |
| (D) | excitation of electrons from low energy levels to higher energy levels |

15. Sodium is not observed in **+**2 oxidation state because of its

|  |  |
| --- | --- |
| (A) | high first ionization potential |
| (B) | high second ionization potential |
| (C) | high ionic radius |
| (D) | high electronegativity |

16. The oxides of beryllium are

|  |  |
| --- | --- |
| (A) | acidic |
| (B) | basic |
| (C) | neutral |
| (D) | amphoteric |

17. Sodium metal is kept under

|  |  |
| --- | --- |
| (A) | water |
| (B) | alcohol |
| (C) | kerosene |
| (D) | benzene |

18. Aluminium is more reactive but less easily corroded than iron, because

|  |  |
| --- | --- |
| (A) | aluminium is noble metal |
| (B) | oxygen forms a protective oxide layer |
| (C) | iron undergoes reaction easily with water |
| (D) | iron forms mono and divalent ions |

19. Inorganic benzene is

|  |  |
| --- | --- |
| (A) | B2H6 |
| (B) | B3N3H6 |
| (C) | B3O3H6 |
| (D) | P3N3H6 |

20. Reaction of PCl3 and PhMgBr would give

|  |  |
| --- | --- |
| (A) | Bromobanzene |
| (B) | Chlorobenzene |
| (C) | Triphenylphosphine |
| (D) | Dichlorobenzene |

21. Percentage of Au in 20 carat gold ornaments is

|  |  |
| --- | --- |
| (A) | 91.6% |
| (B) | 83.3% |
| (C) | 85.4% |
| (D) | 87.5% |

22. Which of the following is used in dry cell?

|  |  |
| --- | --- |
| (A) | KMnO4 |
| (B) | MnO2 |
| (C) | K2Cr2O7 |
| (D) | K2MnO2 |

23. The alloy used to fill dental cavities is

|  |  |
| --- | --- |
| (A) | Sodium amalgam |
| (B) | Zinc chloride |
| (C) | Mercury |
| (D) | Mercury amalgam |

24. The catalyst used in the Haber process for the manufacture of NH3 is

|  |  |
| --- | --- |
| (A) | Pt |
| (B) | Fe **+** Mo |
| (C) | CuO |
| (D) | Al2O3 |

25. Predict the group of elements which has completely filled d-orbitals

|  |  |
| --- | --- |
| (A) | Ag, Pd, Pt |
| (B) | Zn, Hg, Ir |
| (C) | Ag, Au, Pt |
| (D) | Pd, Au, Ag |

26. Which of the following has highest value of their second ionization enthalpy? (Atomic number of V, Cr, Mn and Fe are 23, 24, 25 and 26 respectively)

|  |  |
| --- | --- |
| (A) | V |
| (B) | Cr |
| (C) | Mn |
| (D) | Fe |

27. Which among the following is due to the lanthanide contraction?

|  |  |
| --- | --- |
| (A) | Zn and Zr have same oxidation state |
| (B) | Zr and Hf have same covalent and ionic radius |
| (C) | Zr and Nb have same oxidation state |
| (D) | Zr and Yb have same covalent and ionic radius |

28. Which group of ions have d2 configuration?

|  |  |
| --- | --- |
| (A) | Ti3+, V2+, Cr3+, Mn4+ |
| (B) | Ti1+, V4+, Cr6+, Mn7**+** |
| (C) | Ti4+, V3+, Cr2+, Mn3+ |
| (D) | Ti2+, V3+, Cr4+, Mn5+ |

29. What is the atomic number of the element with the electronic configuration [Kr] 4d10?

|  |  |
| --- | --- |
| (A) | 46 |
| (B) | 48 |
| (C) | 47 |
| (D) | 45 |

30. [Co(NH3)6]3**+** ion is :

|  |  |
| --- | --- |
| (A) | Paramagentic |
| (B) | Diamagnetic |
| (C) | Square planar |
| (D) | Trigonalbipyramidal |

31. The type of isomerism shown by [Co(en)2(NCS)2]Cl and [Co(en)2(NCS)Cl]NCS is

|  |  |
| --- | --- |
| (A) | Coordination |
| (B) | Ionization |
| (C) | Linkage |
| (D) | All of the above |

32. Diethylene triamine is an example of

|  |  |
| --- | --- |
| (A) | Monodentate ligand |
| (B) | Bidentate ligand |
| (C) | Tridentate ligand |
| (D) | Hexadentate ligand |

33. Number of possible optical isomers in [Co(en)2Cl2]**+** is

|  |  |
| --- | --- |
| (A) | 2 |
| (B) | 3 |
| (C) | 4 |
| (D) | 6 |

34. Which one of the following is true according to the postulates of Werner’s theory for coordination compounds?

|  |  |
| --- | --- |
| (A) | Primary valencies are ionizable |
| (B) | Secondary valencies are ionizable |
| (C) | Only primary valencies are non-ionizable |
| (D) | Primary and secondary valencies are non-ionizable |

35. Predict the correct order of the increasing field strength of the ligands NH3, ethylenediamine (en), CN– and CO.

|  |  |
| --- | --- |
| (A) | CO < NH3 < en < CN– |
| (B) | NH3 < en < CN– < CO |
| (C) | CN– < NH3 < CO < en |
| (D) | en < CN– < NH3 < CO |

36. Among the following, which metal forms an organometallic bond in the Grignard reaction?

|  |  |
| --- | --- |
| (A) | Sodium |
| (B) | Titanium |
| (C) | Magnesium |
| (D) | Palladium |

37. Zeigler-Natta catalyst is used for which type of reaction.

|  |  |
| --- | --- |
| (A) | Hydrogenation |
| (B) | Polymerisation |
| (C) | Oxidation |
| (D) | Reduction |

38. What is the oxidation state of chromium in Na2[CrF4O] complex?

|  |  |
| --- | --- |
| (A) | II |
| (B) | III |
| (C) | IV |
| (D) | VI |

39. The geometries of Zn(CN)42– and Ni(CN)42–are

|  |  |
| --- | --- |
| (A) | tetrahedral and square planar respectively |
| (B) | tetrahedral and tetrahedral respectively |
| (C) | square planar and tetrahedral respectively |
| (D) | square planar and square planar respectively |

40. In which of the following reaction, Wilkinson’s catalyst is used?

|  |  |
| --- | --- |
| (A) | Polymerisation |
| (B) | Condensation |
| (C) | Halogenation |
| (D) | Hydrogenation |

41. Which one of the following halides is soluble in water?

|  |  |
| --- | --- |
| (A) | AgF |
| (B) | AgCl |
| (C) | AgBr |
| (D) | AgI |

42. The metal whose salts do not give the borax bead test is

|  |  |
| --- | --- |
| (A) | Cr |
| (B) | Pb |
| (C) | Ni |
| (D) | Mn |

43. Formation of a rose-red precipitate, when a slightly alkaline solution of an inorganic salt is treated with dimethylglyoxime, confirms the presence of

|  |  |
| --- | --- |
| (A) | Fe |
| (B) | Co |
| (C) | Ni |
| (D) | Zn |

44. An example for interfering radical is

|  |  |
| --- | --- |
| (A) | Phosphate |
| (B) | Sulphate |
| (C) | Sulphide |
| (D) | Nitride |

45. Which of the following pairs of ions are not precipitated while adding acidic solution of H2S?

|  |  |
| --- | --- |
| (A) | Cu2**+**, Cd2**+** |
| (B) | Bi3**+**, As3**+** |
| (C) | Sb3**+**, Sn4**+** |
| (D) | Hg2**+**, Ni2**+** |

46. Nitric acid is generally not used for preparation of original solution in analysis of basic radicals, because

|  |  |
| --- | --- |
| (A) | it is a strong oxidising agent |
| (B) | it is a reducing agent |
| (C) | it forms insoluble nitrates |
| (D) | nitrate ions cause interference with the scheme of analysis |

47. CFSE of a cobalt(III) octahedral complex is

|  |  |
| --- | --- |
| (A) | Dq |
| (B) | Dq **+** 3 P |
| (C) | Dq **+** 2 P |
| (D) | Dq **+** 2 P |

48. The *d* orbital splitting in a square planar field is

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

49. The metal present in hemocyanin is

|  |  |
| --- | --- |
| (A) | Fe |
| (B) | Cu |
| (C) | Fe and Zn |
| (D) | Mo |

50. A nickel complex is red in colour and is diamagnetic. The structure of the complex is

|  |  |
| --- | --- |
| (A) | octahedral |
| (B) | tetrahedral |
| (C) | square pyramidal |
| (D) | square planar |

51. IUPAC name of the following compound



|  |  |
| --- | --- |
| (A) | N-Ethyl-N-methylcyclopropanamide |
| (B) | N-Ethyl-N-methylcyclopropanecarboxamide |
| (C) | N-methyl-N-ethylcyclopropanamide |
| (D) | N-cyclopropanoyl-N-methylethanamine |

52. Alkanamines have the general formula

|  |  |
| --- | --- |
| (A) | C*n* H2*n***–**1 N |
| (B) | C*n* H2*n*+1 N |
| (C) | C*n* H2*n*+3 N |
| (D) | C*n* H2*n***–**3 N |

53. Index of hydrogen deficiency for C6N4 is

|  |  |
| --- | --- |
| (A) | 9 |
| (B) | 5 |
| (C) | 7 |
| (D) | 4 |

54. Steam distillation is applicable for the separation and purification of organic compounds which

|  |  |
| --- | --- |
| (i) | are insoluble in H2O |
| (ii) | are volatile in steam |
| (iii) | possess a high vapour pressure at 373 K |
| (iv) | contain non-volatile impurities |

|  |  |
| --- | --- |
| (A) | (i), (ii) |
| (B) | (ii), (iii) |
| (C) | (i), (ii), (iii) |
| (D) | (i), (ii), (iii), (iv) |

55. In which of the following, functional group isomerism is not possible

|  |  |
| --- | --- |
| (A) | C2H6O |
| (B) | C2H4O2 |
| (C) | C2H5Cl |
| (D) | C2H3N |

56. The principle involved in paper chromatography is

|  |  |
| --- | --- |
| (A) | Adsorption |
| (B) | Differential solubility |
| (C) | Partition |
| (D) | Size exclusion |

57. The correct stability order of the following cations

|  |  |  |
| --- | --- | --- |
|  |  |  |
| (I) | (II) | (III) |

|  |  |
| --- | --- |
| (A) | (II) > (I) > (III) |
| (B) | (II) > (III) > (I) |
| (C) | (III) > (I) > (II) |
| (D) | (I) > (II) > (III) |

58. The state of hybridization of C1 and C3 in CH2=C=CH-CN

|  |  |
| --- | --- |
| (A) | *sp* and *sp*2 |
| (B) | *sp*2 and *sp* |
| (C) | Both *sp*2 |
| (D) | Both *sp* |

59. Among the following, strongest Hydrogen bonds are present in

|  |  |
| --- | --- |
| (A) | CH3CO2H |
| (B) | CH3CH2NH2 |
| (C) | CH3CH2OH |
| (D) | CH3CH2SH |

60. Which of the following free radicals is most stable?

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

61. Cyclopentadienyl anion is

|  |  |
| --- | --- |
| (A) | anti-aromatic |
| (B) | aromatic |
| (C) | non-aromatic |
| (D) | homoaromatic |

62. Higher stability of but-2-ene over but-1-ene is attributable to

|  |  |
| --- | --- |
| (A) | Inductive effect |
| (B) | π-delocalization |
| (C) | Steric effect |
| (D) | Hyperconjugative effect |

63. Hunsdiecker reaction proceeds by …………… mechanism.

|  |  |
| --- | --- |
| (A) | Carbocation |
| (B) | Carbanion |
| (C) | Free radical |
| (D) | Nitrene |

64. The compound/s which shows tautomerism is/are

|  |  |  |  |
| --- | --- | --- | --- |
| CH3COCH3 | NH2CONH2 | NH2CSNH2 | CHEMISTRY PG (ORGANIC) SET II 001.jpg |
| (I) | (II) | (III) | (IV) |

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

65. The most stable conformer of ethylene glycol (HO-CH2-CH2OH)

|  |  |
| --- | --- |
| (A) | Gauche |
| (B) | Staggered |
| (C) | Anti |
| (D) | Eclipsed |

66. Number of π-electrons in cyclobutadienyl anion

|  |  |
| --- | --- |
| (A) | 2 |
| (B) | 3 |
| (C) | 4 |
| (D) | 6 |

67. Which among the following reactions proceeds through a radical intermediate?

|  |  |
| --- | --- |
| (A) | CH3-CH=CH2 **+** HBr  CH3-CH(Br)CH3 |
| (B) | CH3-CH=CH2 **+** HBr  CH3-CH2-CH2Br |
| (C) | CH3-CH=CH2 **+** Br2  CH3-CH(Br)CH2(Br) |
| (D) | CH3-CH=O **+** HCN  CH3CH(OH)CN |

68. Which of the following statements is not true for SN1 substitution reaction?

|  |  |
| --- | --- |
| (A) | The rate of reaction does not depend on the molar concentration of the nucleophile |
| (B) | Is accelerated by nonpolar solvents |
| (C) | The rate of reaction is altered by the addition of electrolyte |
| (D) | E1 elimination completes with SN1 substitution |

69. Which compound would give 5-oxo-4-methylhexanal upon ozonolysis?

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

70. Which among the following compounds does not show geometrical isomerism?

|  |  |
| --- | --- |
| (A) | 2,3-dimethylbut-2-ene |
| (B) | 1,2-dibromopropene |
| (C) | 2,3-dibromobut-2-ene |
| (D) | 3-methylpent-2-ene |

71. How many isomers of C5H11OH will be primary alcohols?

|  |  |
| --- | --- |
| (A) | 2 |
| (B) | 3 |
| (C) | 4 |
| (D) | 5 |

72. The number of possible stereoisomers for a compound of the structural formula CH3-CH=CH-CH(OH)-CH3 is

|  |  |
| --- | --- |
| (A) | 6 |
| (B) | 4 |
| (C) | 3 |
| (D) | 2 |

73. The correct statement about compounds A and B are



|  |  |
| --- | --- |
| (A) | A and B are identical |
| (B) | A and B are enantiomers |
| (C) | A and B diastereomers |
| (D) | None of the above |

74. Major product X formed in the following reaction is



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

75. The stable product (X) formed in the following reaction



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

76. Major carbene intermediate (X) formed in the following reaction



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

77. Consider the following reaction



The structure of C3H6Cl2

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

78. The IUPAC name of the major product X formed in the following reaction when the two reagents are taken in a 1:1 molar ratio is:



|  |  |
| --- | --- |
| (A) | ethoxy-2-bromoethane |
| (B) | ethoxy-2-chloroethane |
| (C) | 2-chloroethoxyethane |
| (D) | 1-chloroethoxyethane |

79. How many monohalogenated hydrocarbons, including stereoisomers are possible when 2-methylbutane is chlorinated?

|  |  |
| --- | --- |
| (A) | 3 |
| (B) | 4 |
| (C) | 5 |
| (D) | 6 |

80. Choose the correct set of products formed in the following reaction



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |

|  |  |
| --- | --- |
| (A) | All five products |
| (B) | (I), (II), (IV), (V) |
| (C) | (I) only |
| (D) | (I) and (IV) |

81. The product (X) of the following deamination reaction via Hofmann exhaustive methylation is



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

82. Which path is most suitable for the preparation of 4-bromonitrobenzene?



|  |  |
| --- | --- |
| (A) | (I) |
| (B) | (II) |
| (C) | Either (I) or (II) |
| (D) | Neither (I) nor (II) |

83. Major product/products formed when ethanol is heated with bleaching powder followed by acidification is/are

|  |  |
| --- | --- |
| (A) | CHCl3 and formic acid |
| (B) | CH3CHO |
| (C) | CH3CO2H |
| (D) | ClCH2CH2OH |

84. Product Y obtained in the following reaction sequence is



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

85. Consider the following sequence of reactions



The final product Z is

|  |  |
| --- | --- |
| (A) | propionic acid |
| (B) | propyne |
| (C) | 2-ethoxypropane |
| (D) | 1-ethoxypropane |

86. Consider the following sequence of reaction



Which among the following is formed as the major product Z?

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

87. Major product (X) in the following reaction is



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

88. Major product (X) in the following reaction is



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

89. Major product (X) formed in the following reaction is



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

90. The number of aldol products (excluding stereoisomers) formed when a 1:1 mixture of propanal and ethanal is treated with alkali is:

|  |  |
| --- | --- |
| (A) | 2 |
| (B) | 6 |
| (C) | 8 |
| (D) | 4 |

91. Major product (X) in the following reaction is



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

92. The product (X) in the following is



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

93. Major product (Z) in the following reaction sequence is



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

94. The reactivity of RCOCl (I), RCOOCOR (II), RCOOR (III) and RCONH2 (IV) with nucleophilic reagents follows the order

|  |  |
| --- | --- |
| (A) | (IV) > (III) > (II) > (I) |
| (B) | (I) > (II) > (III) > (IV) |
| (C) | (I) > (IV) > (III) > (II) |
| (D) | (II) > (I) > (IV) > (III) |

95. The strongest base among the following compounds is

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

96. The final product (P) in the following reaction is



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

97. Nitrobenzene can be reduced to phenylhydroxylamine (PhNHOH) using

|  |  |
| --- | --- |
| (A) | Sn/HCl |
| (B) | (NH4)2S |
| (C) | Pd/H2 |
| (D) | Zn/NH4Cl |

98. Which of the following will form the same aldaric acid on oxidation with dil. HNO3?

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| (I) | (II) | (III) | (IV) |

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

99. A tripeptide contains glycine, alanine and serine. How many different sequences are possible?

|  |  |
| --- | --- |
| (A) | 6 |
| (B) | 8 |
| (C) | 5 |
| (D) | 4 |

100. Bakelite is a condensation polymer formed from

|  |  |
| --- | --- |
| (A) | Phenol and formaldehyde |
| (B) | Urea and formaldehyde |
| (C) | Terephthalic acid and ethylene glycol |
| (D) | Melamine and formaldehyde |

101. Zero-point energy of harmonic oscillator

|  |  |
| --- | --- |
| (A) |  |
| (B) | *hv* |
| (C) | zero |
| (D) |  |

102. 1 eV = ……………

|  |  |
| --- | --- |
| (A) | 1.38 **×** 10–23 J |
| (B) | 1.602 **×** 10–19 J |
| (C) | 4.186 J |
| (D) | 8.314 J |

103. The wavelength of electromagnetic radiation of wave number 1.5 **×** 106 m–1

|  |  |
| --- | --- |
| (A) | 660 nm |
| (B) | 66 nm |
| (C) | 6.6 nm |
| (D) | 0.66 nm |

104. The mean relative speed, *ʋ*rel, is

|  |  |
| --- | --- |
| (A) | *ʋ*rel = 2½ *ʋ*mean |
| (B) | *ʋ*rel = (2RT) *ʋ*mean |
| (C) | *ʋ*rel = (½RT) *ʋ*mean |
| (D) | *ʋ*rel = (log 2) *ʋ*mean |

105. Choose the correct expression.

|  |  |
| --- | --- |
| (A) | 1 A = 1 Cs–1,where A is ampere and C is coulombs |
| (B) | 1 A = 1 Cs, where A is ampere and C is coulombs |
| (C) | 1 A = 1 V ohm–1 |
| (D) | 1 A = 1 V s–1 |

106. The …………… is the variation of internal energy with volume at constant temperature.

|  |  |
| --- | --- |
| (A) | Joule-Thomson effect |
| (B) | isenthalpic expansion |
| (C) | heat capacity |
| (D) | internal pressure |

107. The principal axis in benzene

|  |  |
| --- | --- |
| (A) | C3 |
| (B) | S3 |
| (C) | C2 |
| (D) | C6 |

108. A differential scanning calorimeter measures the

|  |  |
| --- | --- |
| (A) | Weight |
| (B) | Temperature |
| (C) | Heat capacity |
| (D) | Energy transferred as heat |

109. Choose the molecules belonging to the point group C2v

|  |  |
| --- | --- |
| I. | H2O |
| II. | CH2Cl2 |
| III. | C6H5Cl |
| IV. | NH3 |

|  |  |
| --- | --- |
| (A) | I, II and III |
| (B) | IV only |
| (C) | II and IV |
| (D) | None of the above |

110. Number of symmetry operations associated with C3v

|  |  |
| --- | --- |
| (A) | 2 |
| (B) | 4 |
| (C) | 3 |
| (D) | 6 |

111. The selection rule for anharmonic oscillator

|  |  |
| --- | --- |
| (A) | ∆*v* = 0 |
| (B) | ∆*v* = ±1, ±2, ±3… |
| (C) | ∆*v* = ±1 |
| (D) | ∆*v* = ±½ |

112. a ≠ b ≠ c and γ ≠ α = β = 90° belong to the class

|  |  |
| --- | --- |
| (A) | Monoclinic |
| (B) | Cubic |
| (C) | Orthorhombic |
| (D) | Tetragonal |

113. Which molecule belongs to asymmetric top type?

|  |  |
| --- | --- |
| (A) | O3 |
| (B) | HCN |
| (C) | CH4 |
| (D) | NH3 |

114. Pick out the molecule showing both microwave and infrared spectra: Br2, CS2, HBr, H2

|  |  |
| --- | --- |
| (A) | HBr |
| (B) | H2 |
| (C) | Br2 |
| (D) | CS2 |

115. Ramachandran plot

|  |  |
| --- | --- |
| (A) | The logarithmic dependence of the molar Gibbs energy on the pressure |
| (B) | A contour diagram of potential energy against the angles Ѱ and φ |
| (C) | log k *vs* 1/T |
| (D) | Internal energy, V *vs* Temp |

116. Which of the following are nonlinear operators?

|  |  |
| --- | --- |
| I. | Â *f*(*x*) = SQR *f*(*x*) |
| II. | Â *f*(*x*) = 0 |
| III. | Â *f*(*x*) = ln *f*(*x*) |
| IV. | Â *f*(*x*) = [*f*(*x*)]–1 |

|  |  |
| --- | --- |
| (A) | none |
| (B) | all |
| (C) | II Only |
| (D) | I, III and IV |

117. Number of vibrational degrees of freedom of CO2

|  |  |
| --- | --- |
| (A) | 4 |
| (B) | 2 |
| (C) | 3 |
| (D) | 0 |

118. Unit of g-factor

|  |  |
| --- | --- |
| (A) | dimensionless |
| (B) | s–1 |
| (C) | oC |
| (D) | mol–1 |

119. Point group of *trans*CHCl = CHCl

|  |  |
| --- | --- |
| (A) | C2h |
| (B) | C3v |
| (C) | C∞v |
| (D) | C1 |

120. Which one of the following molecules does not have IR active vibrations?

|  |  |
| --- | --- |
| (A) | NO |
| (B) | H2 |
| (C) | N2O |
| (D) | CH4 |

121. Pick out the spherical rotors: CH4, CH3Cl, C6H6 and HCl

|  |  |
| --- | --- |
| (A) | HCl |
| (B) | C6H6 |
| (C) | CH4 |
| (D) | C6H6 and HCl |

122. Pick out the ion possessing the high value of equivalent conductance at infinite dilution?

|  |  |
| --- | --- |
| (A) | OH**–** |
| (B) | H+ |
| (C) | Li+ |
| (D) | F**–** |

123. The point group associated with a linear molecule

|  |  |
| --- | --- |
| (A) | C∞v and D∞h |
| (B) | C∞v only |
| (C) | C1 |
| (D) | D∞h only |

124. Number of one-dimensional irreducible representations associated with C2v point group

|  |  |
| --- | --- |
| (A) | 6 |
| (B) | 3 |
| (C) | 4 |
| (D) | 1 |

125. Which one of the following molecules is microwave active?

HCl, H2, CH4 and SF6

|  |  |
| --- | --- |
| (A) | HCl |
| (B) | H2 |
| (C) | SF6 |
| (D) | CH4 |

126. Lowest energy electronic transition

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

127. Ionic strength of uni-univalent electrolyte is equal to

|  |  |
| --- | --- |
| (A) | zero |
| (B) | molarity |
| (C) | one |
| (D) | infinity |

128. X-rays are used in …………… spectroscopy.

|  |  |
| --- | --- |
| (A) | UV |
| (B) | IR |
| (C) | Photoelectron |
| (D) | ESR |

129. Symmetry number of methane

|  |  |
| --- | --- |
| (A) | 6 |
| (B) | 12 |
| (C) | 3 |
| (D) | 0 |

130. Root – mean – square speed of NO2 at 25°C

|  |  |
| --- | --- |
| (A) | 515 ms–1 |
| (B) | 5.15 ms–1 |
| (C) | 0.515 ms–1 |
| (D) | 51.5 ms–1 |

131. Spin angular momentum of a photon

|  |  |
| --- | --- |
| (A) | 1.49 **×** 10–23 Js |
| (B) | 1.49 **×** 10–34 Js |
| (C) | 1.49 **×** 10–10 Js |
| (D) | 1.49 **×** 10–2 Js |

132. Pick out the Boson

|  |  |
| --- | --- |
| (A) | proton |
| (B) | neutron |
| (C) | deuteron |
| (D) | electron |

133. Essential symmetry of triclinic system

|  |  |
| --- | --- |
| (A) | one C3 axis |
| (B) | none |
| (C) | one C6 axis |
| (D) | one C2 axis |

134. Choose the Fermion(s) from the following: photons, deuterons, electrons and protons

|  |  |
| --- | --- |
| (A) | photons and deuterons |
| (B) | electrons and protons |
| (C) | deuterons and protons |
| (D) | photons and electrons |

135. The half-life of a second order reaction

|  |  |
| --- | --- |
| (A) | t½ = , where [A]0 is initial concentration |
| (B) | t½ =, where [A]0 is initial concentration |
| (C) | t½ = *k*, where [A]0 is initial concentration |
| (D) | t½ = 0.693*k*, where [A]0 is initial concentration |

136. Dispersion of liquid into a gas is called

|  |  |
| --- | --- |
| (A) | foam |
| (B) | aerosol |
| (C) | smoke |
| (D) | gel |

137. Choose the molecule(s) with a center of symmetry

|  |  |
| --- | --- |
| (I) | SF6 |
| (II) | CO2 |
| (III) | XeF4 |
| (IV) | H2O |

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

138. Possible microstates for a carbon atom with the configuration 1s2 2s2 2p2

|  |  |
| --- | --- |
| (A) | 12 |
| (B) | 6 |
| (C) | 15 |
| (D) | 9 |

139. Unit of partition function

|  |  |
| --- | --- |
| (A) | dimensionless |
| (B) | s–1 |
| (C) | J |
| (D) | K–1 |

140. Pick out the nuclei having spin, I = 1

|  |  |
| --- | --- |
| (I) | 1H |
| (II) | 2D |
| (III) | 14N |
| (IV) | 19F |

|  |  |
| --- | --- |
| (A) | (II) and (III) |
| (B) | (I) only |
| (C) | (IV) only |
| (D) | (I) and (IV) |

141. The bond order of NO

|  |  |
| --- | --- |
| (A) | 2½ |
| (B) | 2 |
| (C) | 1 |
| (D) | 3 |

142. Used as sensitizer for the production of hydrogen atoms from H2

|  |  |
| --- | --- |
| (A) | Hg |
| (B) | Ag |
| (C) | Pb |
| (D) | Al |

143. First line in the rotational spectrum of CO is 3.842 cm–1. The rotational constant is equal to

|  |  |
| --- | --- |
| (A) | 19.21 cm–1 |
| (B) | 0.1921 cm–1 |
| (C) | 1.921 cm–1 |
| (D) | 38.42 cm–1 |

144. A solution shows absorbance A = 1.0. What percentage of radiation is absorbed by the sample?

|  |  |
| --- | --- |
| (A) | 10 |
| (B) | 50 |
| (C) | 90 |
| (D) | 100 |

145. The number of radial nodes of 4*d* atomic orbital is

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

146. For the reaction A  P the plot of concentration of P Vs time is linear passing through the origin. The order of the reaction is

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

147. A buffer is prepared by mixing 100 ml, 0.1 M acetic acid (pKa = 4.76) and 100 ml, 0.1 M sodium acetate. The pH of the solution is

|  |  |
| --- | --- |
| (A) | 4.76 |
| (B) | 7.00 |
| (C) | 3.76 |
| (D) | 5.76 |

148. Which of the following is not an electrokinetic phenomena?

|  |  |
| --- | --- |
| (A) | Electrophoresis |
| (B) | Electro osmosis |
| (C) | Streaming potential |
| (D) | Donnan membrane equilibrium |

149. Which of the following photochemical reaction has highest quantum yield?

|  |  |
| --- | --- |
| (A) | H2 – Cl2 |
| (B) | H2 – Br2 |
| (C) | H2 – I2 |
| (D) | Decomposition of ozone |

150. In Raman spectroscopy …………… radiation is analyzed.

|  |  |
| --- | --- |
| (A) | transmitted |
| (B) | emitted |
| (C) | scattered |
| (D) | fluorescent |

