No. of Printed Pages : **24**

00600

M.Sc. Chemistry Entrance Test for M.Sc. Chemistry Programmes 2011

Name _____ *Enrolment No.* _____

Total No. of Questions : 150 ***Time : 180 Minutes***

- All questions are *compulsory.*
- Use of calculator is ***not*** allowed. Rough work may be done in the space provided at the end of the Test Booklet.
- Read the instructions given on the OMR Response Sheet carefully before you start.

How to fill up the information on the OMR Response Sheet

(Examination Answer Sheet)

1. Write your complete enrolment no. in 9 digits. This should correspond to the enrolment number indicated by you on the OMR Response Sheet. Also write your correct name, address with pin code in the space provided. Put your signature on the OMR Response Sheet with date. Ensure that the Invigilator in your examination hall also puts his signature with date on the OMR Response Sheet at the space provided.

2. On the OMR Response Sheet student's particulars are to be filled in by pen. However use HB pencil for writing the Enrolment No. and Examination Centre Code as well as for blackening the circle bearing the correct answer number against the serial number of the question.

3. Do not make any stray remarks on this sheet.

4. Write correct information in numerical digit in Enrolment No. and Examination Centre Code Columns. The corresponding circle should be dark enough and should be filled in completely.

5. Each question is followed by four probable answers which are numbered 1, 2, 3 and 4. You should select and show only one answer to each question considered by you as the most appropriate or the correct answer. Select the most appropriate answer. Then by using HB pencil, blacken the circle bearing the correct answer number against the serial number of the question. If you find that answer to any question is none of the four alternatives given under the question, you should darken the circle with '0'.

6. If you wish to change your answer, ERASE completely the already darkened circle by using a good quality eraser and then blacken the circle bearing your revised answer number. If incorrect answer is not erased completely, smudges will be left on the erased circle and the question will be read as having two answers and will be ignored for giving any credit.

7. No credit will be given if more than one answer is given for one question. Therefore, you should select the most appropriate answer.

8. You should not spend too much time on any one question. If you find any particular question difficult, leave it and go to the next. If you have time left after answering all the questions, you may go back to the unanswered ones. There is no negative marking for wrong answers.

GENERAL INSTRUCTIONS

1. No cell Phones, calculators, books, slide-rules, note-books or written notes, etc. will be allowed inside the examination hall.

2. You should follow the instructions given by the Centre Superintendent and by the Invigilator at the examination venue. If you violate the instructions, you will be disqualified.

3. Any candidate found copying or receiving or giving assistance in the examination will be disqualified.

4. The Test Booklet and the OMR Response Sheet (Answer Sheet) would be supplied to you by the Invigilators. **After the examination is over, you should hand over the OMR Response Sheet to the Invigilator before leaving the examination hall.** Any candidate who does not return the OMR Response Sheet will be disqualified and the University may take further action against him/her.

5. All rough work is to be done on the test booklet itself and not on any other paper. Scrap paper is not permitted. For arriving at answers you may work in the margins, make some markings or underline in the test booklet itself.

6. The University reserves the right to cancel scores of any candidate who impersonates or uses/adopts other malpractices or uses any unfair means. The examination is conducted under uniform conditions. The University would also follow a procedure to verify the validity of scores of all examinees uniformly. If there is substantial indication that your performance is not genuine, the University may cancel your score.

7. In the event of your qualifying the Entrance Test, the hall ticket should be enclosed with your admission form while submitting it to the University for seeking admission in M.Sc. (Chemistry) Programme along with your testimonials and programme fee. Admission forms received without hall ticket in original will be summarily rejected.

1. The electromagnetic radiation associated with which of the following transitions in a hydrogen atom will have the maximum wavelength ?

(1) From $n=1$ to $n=3$ (2) From $n=2$ to $n=3$

(3) From $n=3$ to $n=4$ (4) From $n=1$ to $n=\alpha$

2. Potassium ejects photoelectrons when irradiated with light of wavelength less than 710 nm. Which of the following lights will eject photoelectrons from potassium with maximum velocity ?

(1) Blue (2) Green (3) Violet (4) Yellow

3. The minimum value of the energy of a particle in a one dimensional box is x units. The value of its energy in the next higher level will be :

(1) $\frac{1}{2}x$ (2) $2x$ (3) $3x$ (4) $4x$

4. The probability of finding the dz^2 electron is zero in :

(1) xy plane (2) xz plane (3) yz plane (4) none of the above

5. In a Born Haber cycle which of the following contributes most in accounting for the high negative standard enthalpy of formation of MgO(s), a stable ionic compound ?

(1) First and second ionization energies of magnesium

(2) Dissociation energy of oxygen

(3) Lattice energy

(4) Electron affinity of O(g)

6. Out of XeF_2, CO_2, SO_2 and NO_2^- the linear species are :

(1) XeF_2 and CO_2 (2) CO_2 and SO_2

(3) XeF_2 and NO_2^- (4) SO_2 and NO_2^-

7. A molecule in which sp^2 hybrid orbitals are employed for bond formation by the central atom is :

(1) NH_3 (2) CO_2 (3) SCl_2 (4) H_2CO

8. Carbon-Carbon bond order in C_2^{2-} is :

(1) 1 (2) 2 (3) 3 (4) 4

9. In which of the following ionizations the respective bond order decreases ?

(1) $O_2(g) \longrightarrow O_2^+(g) + e$

(2) $N_2(g) \longrightarrow N_2^+(g) + e$

(3) $NO(g) \longrightarrow NO^+(g) + e$

(4) $He_2 \longrightarrow He_2^+(g) + e$

10. Amongst PF_3, CS_2, SF_4 and SF_6 the polar molecules are :

(1) PF_3 and SF_6 (2) CS_2 and SF_4

(3) PF_3 and SF_4 (4) CS_2 and SF_6

11. After one hour the amount of a certain radioactive substance disintegrated was $\frac{15^{th}}{16}$ of the original amount. The half life of the radioactive substance is :

(1) 15 min. (2) 30 min. (3) 7.5 min. (4) 52.5 min.

12. The outermost electron configuration of an element is $5s^2\ 5p^3$. The atomic number of this element is :

(1) 33 (2) 34 (3) 51 (4) 52

13. Which of the following has the highest electronegativity ?

(1) Na (2) Mg (3) K (4) Ca

14. The correct order of ionization energies of F^-, Cl^-, F and Cl is :

(1) $F^- < Cl^- < F < Cl$ (2) $F^- < Cl < Cl^- < F$

(3) $F^- < Cl^- < Cl < F$ (4) $Cl^- < F^- < Cl < F$

15. The correct order of the sizes of the species Ca^{2+}, Cl^-, S^{2-} and K^+ is :

(1) $Ca^{2+} < K^+ < Cl^- < S^{2-}$ (2) $K^+ < Cl^- < Ca^{2+} < S^{2-}$

(3) $S^{2-} < Cl^- < K^+ < Ca^{2+}$ (4) $Cl^- < S^{2-} < K^+ < Ca^{2+}$

16. The correct order of decreasing boiling points of NH_3, PH_3 and AsH_3 is :

(1) $NH_3 > PH_3 > AsH_3$ (2) $AsH_3 > PH_3 > NH_3$

(3) $NH_3 > AsH_3 > PH_3$ (4) $PH_3 > NH_3 > AsH_3$

17. Which of the following elements will form the least stable superoxide ?

(1) Na (2) K (3) Rb (4) Cs

18. The ionic conductance of alkali metal cations in aqueous solution decreases in the order :

(1) $Cs^+ > Rb^+ > K^+ > Na^+$ (2) $Na^+ > K^+ > Rb^+ > Cs^+$

(3) $K^+ > Na^+ > Cs^+ > Rb^+$ (4) $Rb^+ > Cs^+ > K^+ > Na^+$

19. Among $Mg(OH)_2$, $Ca(OH)_2$, $Sr(OH)_2$ and $Ba(OH)_2$ which has the largest value of the solubility product ?

(1) $Mg(OH)_2$ (2) $Ca(OH)_2$ (3) $Sr(OH)_2$ (4) $Ba(OH)_2$

20. Thermal stability of peroxides of alkaline earth metals decrease in the order :

(1) $CaO_2 > SrO_2 > BaO_2$ (2) $BaO_2 > SrO_2 > CaO_2$

(3) $SrO_2 > CaO_2 > BaO_2$ (4) $SrO_2 > BaO_2 > CaO_2$

21. Which of the following statements regarding diborane is *NOT* correct ?

(1) It is an electron deficient molecule

(2) There is free rotation about B-B bond

(3) The bonding of two hydrogens is of one type whereas the bonding of the other four is of different type

(4) Its final hydrolysis products are hydrogen and boric acid

22. Which of the following statements about anhydrous aluminium chloride is correct ?

(1) It exists as $AlCl_3$ molecules (2) It is not easily hydrolysed

(3) It is a volatile compound (4) It is a moderately strong Lewis base

23. Which of the following statements is *NOT* correct about freons ?

(1) They are gases at room temperature

(2) They are hydrolysed by water

(3) They are thermally stable

(4) They are chlorofluorocarbons

24. Which is the strongest oxidizing agent among the following ?

(1) CO_2 (2) SiO_2 (3) SnO_2 (4) PbO_2

25. Which of the following statements regarding halides of N and P is ***NOT*** correct ?
(1) PF_5 exists NF_5 does not
(2) PF_3 hydrolyses but NF_3 does not
(3) PCl_3 hydrolyses in the same way as NCl_3
(4) PCl_3 is stable but NCl_3 is not

26. Which of the following is the most basic ?
(1) P_4O_6 (2) P_4O_{10} (3) As_4O_6 (4) Sb_2O_3

27. Which of the following statements is ***NOT*** correct ?
(1) Ionic azides are more stable than covalent azides
(2) Azide ion has an angular shape
(3) Hydrazine is thermally unstable
(4) Hydrazine forms complexes with transition metal ions

28. Which of the following is most acidic ?
(1) H_2O (2) H_2S (3) H_2Se (4) H_2Te

29. Which of the following statements is ***NOT*** correct regarding thiosulphate ion ?
(1) It has tetrahedral shape (2) It has no sulphur-sulphur bond
(3) It can act as reducing agent (4) It can form complex with silver ion

30. HBr and HI reduce H_2SO_4, HCl can reduce $KMnO_4$ and HF can reduce :
(1) H_2SO_4 (2) $KMnO_4$
(3) $K_2Cr_2O_7$ (4) None of the above

31. Which of the following is ***NOT*** true about fluorine ?
(1) It forms polyhalide ions
(2) It forms interhalogen compounds
(3) It forms insoluble calcium fluoride
(4) It forms O_2F_2

32. Which of the following statements is ***NOT*** correct regarding XeF_2 ?
(1) It is a linear molecule
(2) It reacts violently with water
(3) It oxidizes bromate to perbromate
(4) It acts as a fluoride ion donor

33. Among the following which is the least basic ?

(1) Cr_2O_3 (2) CrO_3 (3) CaO (4) K_2O

34. Which of the following cations has the maximum number of unpaired electrons ?

(1) Fe^{3+} (2) Mn^{3+} (3) Fe^{2+} (4) Mn^{4+}

(at. no. of Mn = 25, Fe = 26)

35. Of the following elements one that is ***NOT*** expected to display an oxidation state of +5 in any of its compounds is :

(1) Ti (2) V (3) Cr (4) Mn

36. Chloride of which of the following will be coloured ?

(1) Ag (I) (2) Hg (II) (3) Co(II) (4) Zn(II)

37. For europium (at.no. = 63) which of the following outermost electron configuration is correct ?

(1) $4f^5\ 5d^2\ 6s^2$ (2) $4f^6\ 5d^1\ 6s^2$ (3) $4f^7\ 6s^2$ (4) $4f^7\ 5d^1\ 6s^1$

38. The number of possible isomers of $K[Cr(C_2O_4)_2(H_2O)_2]$ is :

(1) 2 (2) 3 (3) 4 (4) 6

39. Which is ***NOT*** a correct statement regarding the number of unpaired electrons ?

(1) It is 4 in a high spin octahedral complex of d^6 ion

(2) It is 0 in a low spin octahedral complex of d^6 ion

(3) It is 0 in a tetrahedral complex of d^8 ion

(4) It is 0 in a square planar complex of d^8 ion

40. The crystal field stabilization energy of $[Ti(H_2O)_6]^{3+}$ (at. no. of Ti = 22) is $-8160\ cm^{-1}$. What is the value of crystal field splitting energy , Δ_0 of this complex (in cm^{-1}) ?

(1) 8160 (2) 12240 (3) 16320 (4) 20400

41. Malachite is a mineral of :

(1) manganese (2) magnesium (3) tin (4) copper

42. Which of the following statements is correct regarding the slag obtained during the extraction of a metal like Cu or Fe ?

(1) The slag is lighter and lower melting than the metal

(2) The slag is heavier and lower melting than the metal

(3) The slag is lighter and higher melting than the metal

(4) The slag is heavier and higher melting than the metal

43. Electrorefining cannot be used for which of the following ?

(1) Cu (2) Sn (3) Pb (4) Al

44. In which of the following pairs of ions the constituents cannot be separated by $NH_4Cl + NH_4OH$?

(1) Al^{3+}, Fe^{3+} (2) Al^{3+}, Zn^{2+} (3) Fe^{3+}, Co^{2+} (4) Fe^{3+}, Zn^{2+}

45. Which among the following is the most soluble sulphide ?

(1) CuS (2) CdS (3) PbS (4) NiS

46. Which of the following does not dissolve in hot nitric acid ?

(1) HgS (2) CuS (3) CdS (4) SnS

47. Which of the following cations imparts violet colour to a Bunsen flame ?

(1) Sodium (2) Potassium (3) Calcium (4) Barium

48. On treatment with dil.H_2SO_4 which of the following anions would ***NOT*** produce a gas ?

(1) sulphide (2) thiosulphate (3) bromide (4) sulphite

49. On adding $BaCl_2$ solution to the solution of a sodium salt a white precipitate was obtained. The precipitate could not be :

(1) $BaSO_4$ (2) $BaSO_3$ (3) BaF_2 (4) $BaCrO_4$

50. The brown ring obtained in the test for nitrate ions contains the cation :

(1) $[Fe(H_2O)_5NO]^+$ (2) $[Fe(H_2O)_5NO_2]^{2+}$

(3) $[Fe(H_2O)_5NO]^{2+}$ (4) $[Fe(H_2O)_4(NO_2)_2]^+$

51. Reaction of 1-hexene with NBS (N - bromosuccinimide) forms two isomeric bromohexenes, one of which is 3-bromo-1-hexene. Which of the following is the other isomer ?

(1) 1-bromo-2-hexene (2) 6-bromo-1-hexene

(3) 1-bromo-1-hexene (4) 2-bromo-1-hexene

52. The cannizaro reaction of benzaldehyde involves :

(1) intramolecular shift of proton (2) intramolecular shift of hydride

(3) intermolecular shift of proton (4) intermolecular shift of hydride

53. The reaction of m-bromoanisole with $NaNH_2$ in liquid ammonia yields :

(1) *o*-amino anisole (2) *m*-amino anisole

(3) *p*-amino anisole (4) 1, 3-diaminobenzene

54. A compound whose substituents are superimposable on their own mirror image even though they contain asymmetric carbon atoms is called :

(1) a threo isomer (2) an erythro isomer

(3) syn-anti isomer (4) a meso-compound

55. Spin - spin splitting occurs in the NMR spectrum of ethanol (I), ethane(II), ethyl methyl ether(III) , *t*-butyl methyl ether(IV) :

(1) I and II only (2) I and III only (3) I and IV only (4) II and IV only

56 The UV spectrum of acetone shows maximum absorption peak at 279 nm besides other peaks at 166 and 189. The peak at 279 nm is because of which transition ?

(1) $n \rightarrow \sigma^*$ (2) $\pi \rightarrow \pi^*$ (3) $n \rightarrow \pi^*$ (4) $\sigma \rightarrow \sigma^*$

57. o-Nitrophenol is steam volatile whereas p-nitrophenol is not. This is due to :

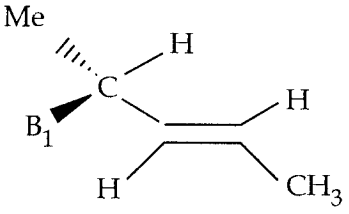
(1) the presence of intramolecular hydrogen bonding in p-nitrophenol

(2) higher dipole moment of o-nitrophenol

(3) the presence of intramolecular hydrogen bonding in o-nitrophenol

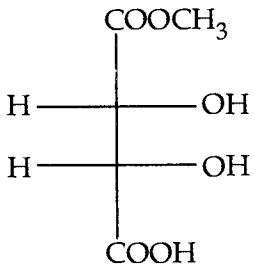
(4) the presence of intermolecular hydrogen bonding in o-nitrophenol

58. The configuration of asymmetric centre and the geometry of the double bond in the following molecule can be described by :

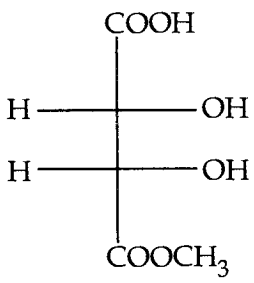


(1) *R* and *E* (2) *S* and *E* (3) *R* and *Z* (4) *S* and *Z*

59. Which of the following statements about A and B are true ?



A



B

(1) A and B are identical (2) A and B are diastereomers

(3) A and B are meso-compounds (4) A and B are enantiomers

60. Which of the following reactions does not proceed through a nitrene intermediate ?

(1) Curtius rearrangement (2) Lossen rearrangement

(3) Beckmann rearrangement (4) Hofmann bromamide reaction

61. Pyridine undergoes electrophilic substitution reaction preferentially at :

(1) Position 2 (2) Position 3

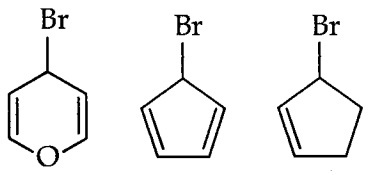
(3) Position 4 (4) Position 2 and Position 4

62. Addition of bromine to maleic acid gives :

(1) d*l*-2,3-Dibromosuccinic acid (2) meso-2,3-Dibromosuccinic acid

(3) d-2,3-Dibromosuccinic acid (4) *l*-2,3-Dibromosuccinic acid

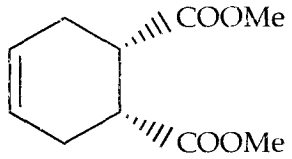
63. The order of reactivity of S_N1 reaction in the following bromides is :



I II III

(1) I > II > III (2) III > II > I (3) II > I > III (4) III > I > II

64. The following molecule can be synthesized from :



(1) 1,3-Butadiene and dimethyl maleate
(2) 1,2-Butadiene and dimethyl maleate
(3) 1,3-Butadiene and dimethyl fumarate
(4) 1,2-Butadiene and dimethyl fumarate

65. Oppenauer oxidation is the reverse of :
(1) Wolff-Kishner reduction
(2) Birch reduction
(3) Clemmensen reduction
(4) Meerwein-Ponndorf-Verley reduction

66. The best reagent for the conversion of an ester to alcohol is :
(1) $LiAlH_4$ (2) H_2/Pd-C (3) $NaBH_4$ (4) Li-NH_3 (liq)

67. β-keto esters are best generated via ?
(1) Aldol reaction (2) Oxidation of an ester
(3) Claisen reaction (4) Hoffman rearrangement

68. Which of the following statements is ***NOT*** true about enzymes ?
(1) They speed up reactions several times compared to uncatalyzed reactions
(2) They are very specific in their action on substrates
(3) They are active at moderate temperature and physiological pH
(4) Each enzyme catalyses a variety of reactions

69. The mechanism of the reaction given below is called

C_6H_5Br + liq. NH_3 + $NaNH_2 \rightarrow C_6H_5NH_2$

(1) S_N1 (2) S_N2
(3) Addition-Elimination (4) Elimination--Addition

70. Which of the following is **NOT** a suitable alkylating agent for active methylene compounds ?
(1) $C_6H_5CH_2Cl$ (2) $CH_2=CHCH_2Cl$
(3) $CH_3CH=CHBr$ (4) $(CH_3)_2SO_4$

71. Which of the following halides **CANNOT** be used for the preparation of Grignard reagent ?

(1) C_6H_5Br (2) $CH_2=CHCl$ (3) $CH_2ClC\equiv CCH_3$ (4) $CH_2BrC\equiv CH$

72. A hydroxy acid on heating gives a 5-membered lactone. The acid is :

(1) $CH_2OHCH_2CH_2COOH$ (2) $CH_3CHOHCH_2COOH$

(3) $CH_3CH_2CHOHCOOH$ (4) $CH_3CHOHCHOHCOOH$

73. The most stable conformation of 2,3-dichlorobutane is :

(1) Eclipsed form (2) Staggered form

(3) Skew form (4) Gauche form

74. Which of the following organic halides will undergo an E2 elimination on heating with KOH in alcohol ?

(1) 2,2-dimethyl-1-bromopropane (2) 2,2-dimethyl-1-bromocyclohexane

(3) benzyl chloride (4) 2,5-dimethyl-1-bromobenzene

75. A tripeptide is composed equally of L-valine, L-tyrosine and L-alanine (one molecule of each). How many isomeric tripeptides of this kind may exist ?

(1) three (2) four (3) six (4) eight

76. Which of the following isomeric dienes is chiral ?

(1) 2,3-pentadiene (2) 3-methyl-1,2-butadiene

(3) 2-methyl-1,3-butadiene (4) 3-methyl-1-pentene

77. Which of the following aldehydes, used alone, will undergo an aldol reaction ?

(1) formaldehyde, CH_2O (2) butanal, $CH_3(CH_2)_2CHO$

(3) benzaldehyde, C_6H_5CHO (4) 2-propenal, $CH_2=CHCHO$

78. Which of the following reactions is most likely to produce ethyl propanoate ?

(1) sodium ethoxide + propanoic acid

(2) propanol + acetyl chloride

(3) sodium propanoate + acetic anhydride

(4) potassium propanoate + ethyl iodide

79. Methyl butyrate is reacted with excess ammonia, and the product is then treated with bromine in aqueous NaOH. What is the expected product ?

(1) butylamine (2) pentylamine

(3) propylamine (4) N-bromobutyramide

80. Which one of the following compounds would react with C_2H_5MgBr to make 3-pentanol ?

(1) ethanal (2) ethyl formate (3) acetic acid (4) acetone

81. A C_8H_{10} hydrocarbon undergoes mononitration by HNO_3 and sulfuric acid. Two isomers of $C_8H_9NO_2$ are obtained. The hydrocarbon C_8H_{10} is :

(1) ethylbenzene (2) ortho-xylene (3) meta-xylene (4) para-xylene

82. If two isomers have been classified correctly as anomers, they may also be called .... ?

(1) conformers (2) enantiomers (3) tautomers (4) diastereomers

83. Which C=O function has the lowest stretching frequency in the infrared spectrum ?

(1) acyl chloride (2) aldehyde (3) amide (4) ester

84. The reaction of toluene with chlorine in presence of heat or light gives :

(1) *o*-chlorotoluene (2) *p*-chlorotoluene

(3) *m*-chlorotoluene (4) benzyl chloride

85. Identify the product in the reaction :

$$PhC{\equiv}CMe \xrightarrow{H_3O^+,\ Hg^{2+}} ?$$

(1) $PhCH_2CH_2CHO$ (2) $PhCH(OH)CH_2CH_3$

(3) $PhCH_2COCH_3$ (4) PhCOCOMe

86. What is the best synthesis for $CH_3CONHCH_3$?

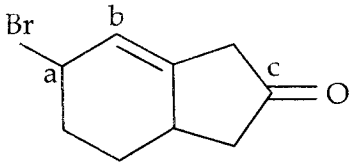
(1) $CH_3COOH + CH_3NH_2 \rightarrow$

(2) $CH_3CONH_2 + CH_3Br \rightarrow$

(3) $CH_3COCl + CH_3NH_2 \rightarrow$

(4) CH_3CN + CH_3MgI followed by treatment with $H_3O^+ \rightarrow$

87. Which of the functional groups on the following molecule are susceptible to nucleophilic attack ?



(1) "a" and "b" (2) "a" and "c" (3) "b" and "c" (4) "a", "b" and "c"

88. 2-Butyne can be converted to Z-2 - butene by :

(1) Rosenmund reduction (2) Birch reduction

(3) Lindlar catalyst (4) Sodium borohydride

89. Which one of the following compounds gives colour reaction with $FeCl_3$?

(1) Acetyl salicylic acid (2) Methyl salicylate

(3) Nitrobenzene (4) Benzoic acid

90. Which of the following reactions is a good method for preparing an aldehyde ?

(1) Jones' reagent and a 3°-alcohol (2) Jones' reagent and a 2°-alcohol

(3) PCC and a 1°-alcohol (4) H_2SO_4, a 1°-alcohol and heat

91. The reaction Ketene of with acetic acid will give :

(1) Oxalic acid (2) Acetic anhydride

(3) Propanoic acid (4) Malonic acid

92. A C_6H_{12} compound reacts with ozone to yield a single C_3H_6O product. Gas phase free radical bromination of the hydrocarbon gives only $C_6H_{11}Br$. Compound A is :

(1) cyclohexane (2) cyclohexene

(3) 3-hexene (4) 2,3-dimethyl-2-butene

93. The ^1H-NMR of 1,1-dibromoethane consists of two well-separated signals,one large and the other small. Which of the following descriptions is correct ?

(1) the large signal is a quartet and the small signal is a doublet

(2) the large signal is a triplet and the small signal is a singlet

(3) the large signal is a singlet and the small signal is a triplet

(4) the large signal is a doublet and the small signal is a quartet

94. The conjugated dienes are different from alkenes by :

(1) Being less stable, less reactive and undergoing 1,3-addition

(2) Being less stable, more reactive and undergoing 1,3-addition

(3) Being more stable, less reactive and undergoing 1,2-addition

(4) Being more stable, more reactive and undergoing 1,4-addition

95. Dehydrobromination of a trans-2-methylcyclohexyl bromide results in :

(1) 1-methyl-1-cyclohexene (2) 1,3-dimethylcyclopentene

(3) 1,2-dimethylcyclopentene (4) 3-methyl-1-cyclohexene

96. The major product of nitration of 1-nitronaphthalene is :

(1) 1,3-dimethylnaphthalene (2) 1,2-dimethylnaphthalene

(3) 1,8-dimethylnaphthalene (4) 1,6-dimethylnaphthalene

97. Which one of the following amines will give carbylamine reaction ?

(1) *tert*-butyl amine (2) trimethyl amine

(3) N-methyl aniline (4) Dimethyl amine

98. The secondary structure of proteins is derived from :

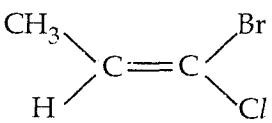
(1) Peptide linkages (2) Hydrogen bonding

(3) Disulfide linkages (4) Folding of chains

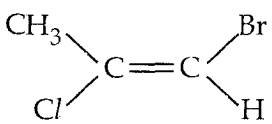
99. An aromatic compound (X) of molecular formula C_7H_7NO liberates ammonia on heating with alkali. When 'X' is treated with bromine and alkali, the product will be :

(1) benzonitrile (2) benzamide (3) aniline (4) benzoic acid

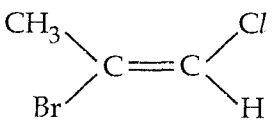
100. Which of the following is a pair of geometric isomers :



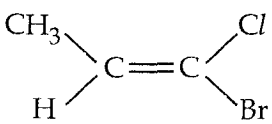
(i)



(ii)



(iii)



(iv)

(1) (i) and (ii) (2) (i) and (iii) (3) (i) and (iv) (4) (ii) and (iii)

101. The energy of an ideal gas depends only on its :

(1) pressure (2) volume

(3) number of moles (4) temperature

102. The root mean square velocity of N_2 molecules in a gas is u. If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atoms, the rms velocity becomes :

(1) u/2 (2) 2u (3) 4u (4) u

103. However great the pressure, a gas can't be liquefied above its :

(1) critical temperature (2) inversion temperature

(3) Boyle's temperature (4) room temperature

104. Which type of crystals contain the maximum number of Bravais lattices ?

(1) Cubic (2) Triclinic (3) Orthorhombic (4) Tetragonal

105. The property which is intensive among the following is :

(1) Free energy (2) Entropy (3) EMF (4) Volume

106. A system is taken from state A to state B along two different paths 1 and 2. The heat absorbed and work done by the system along these paths is, Q_1 and Q_2 and W_1 and W_2 respectively. Which one of the following is correct for this system ?

(1) $Q_1 = Q_2$ (2) $Q_1 + W_1 = Q_2 + W_2$

(3) $W_1 = W_2$ (4) $Q_1 - W_1 = Q_2 - W_2$

107. When *ln* k is plotted against 1/T using Arrhenius equation, a straight line is expected with a slope equal to :

(1) E_a/RT (2) RT/E_a (3) E_a/R (4) R/E_a

108. Of the following mixtures, the most likely mixture near to ideal solution is :

(1) sodium chloride-water (2) ethanol-benzene

(3) heptane-water (4) heptane-octane

109. The ionic strength of 0.1 M $BaCl_2$ is :

(1) 0.3 (2) 0.2 (3) 0.4 (4) 0.1

110. The triple point of water is :

(1) 273.16 K (2) 273.16 K and 760 torr

(3) 273.16 K and 4.58 torr (4) 760 torr

111. The horizontal plane is present in one of the following molecules :

(1) SO_2 (2) NH_3 (3) CH_4 (4) CO_2

112. The molecule which gives rotational spectrum is :

(1) N_2 (2) CH_4 (3) SF_6 (4) CO

113. The selection rule for rotational Raman spectra is :

(1) $\Delta J = \pm 1$ (2) $\Delta J = \pm 2$ (3) $\Delta J = \pm 0$ (4) $\Delta J = \pm 3$

114. Which of the following molecules have lowest vibrational frequency ?

(1) $^1H^{35}Cl$ (2) $^2H^{35}Cl$ (3) $^1H^{36}Cl$ (4) $^1H^{37}Cl$

115. In the IR spectrum of ICl_2^- ion the number of experimentally observed normal modes of vibrations are :

(1) 4 (2) 3 (3) 2 (4) 6

116. The parallel band has no Q-branch in which of the following molecules ?

(1) COS (2) H_2O (3) NH_3 (4) NOCl

117. Which of the following molecule is both IR and Raman active ?

(1) D_2 (2) CH_4 (3) DHO (4) C_2H_2

118. 0.1 M solution of a compound shows absorbance of 0.25 at 525 nm in a 1.0 cm cell. For the same molecule with 0.2 M conc. and in a cell of path length 0.5 cm, the absorbance would be :

(1) 0.5 (2) 1.0 (3) 0.25 (4) 0.75

119. Which of the following nuclei will show NMR spectrum ?

(1) ^{12}C (2) ^{15}N (3) ^{16}O (4) ^{32}S

120. The unit of the rate of reaction is same as that of the rate constant for a :

(1) zero-order reaction (2) first-order reaction

(3) second-order reaction (4) half-order reaction

121. Consider the reaction mechanism

$A_2 \xleftrightarrow{K_1} 2A$ (fast)

$A + B \xleftrightarrow{K_2} P$ (slow)

where A is the intermediate. The rate law for the reaction is :

(1) $k_2 [A][B]$ (2) $k_2 k_1^{1/2} [A_2]^{1/2} [B]$

(3) $k_2 k_1^{1/2} [A][B]$ (4) $k_2 k_1^{1/2} [A]^2 [B]$

122. For the electrochemical cell

$Ag(s) \mid AgCl(s), KCl(aq) \parallel AgNO_3(aq) \mid Ag(s)$

The overall cell reaction is :

(1) $Ag^+ + KCl(aq) \rightarrow AgCl(s) + K^+$

(2) $Ag(s) + AgCl(s) \rightarrow 2Ag(s) + \frac{1}{2} Cl_2(g)$

(3) $AgCl(s) \rightarrow Ag^+ + Cl^-$

(4) $Ag^+ + Cl^- \rightarrow AgCl(s)$

123. The standard reduction potentials of three metallic cations X, Y and Z are 0.52 V, −3.03 V and −1.18 V respectively. The order of reducing power of the corresponding metals is :

(1) Y > Z > X (2) X > Y > Z (3) Z > Y > X (4) Z > X > Y

124. A gaseous mixture contains $CO_2(g)$ and $N_2O(g)$ in a 2 : 5 ratio by mass. The ratio of the number of molecules of $CO_2(g)$ and $N_2O(g)$ is :

(1) 5 : 2 (2) 2 : 5 (3) 1 : 2 (4) 5 : 4

125. Given that $E^0_{Ag^+/Ag} = +0.80$ V and $E^0_{Zn^{2+}/Zn} = -0.76$ V, which of the following is correct ?

(1) Ag^+ can be reduced by H_2 (2) Ag can oxidize H_2 into H^+

(3) Zn^{2+} can be reduced by H_2 (4) Ag can reduce Zn^{2+}

126. The unit of energy is :

(1) $kg\ m^2\ s^{-2}$ (2) $kg\ m\ s^{-2}$ (3) $kg\ m^{-1}\ s^{-2}$ (4) $N\ m^2\ kg^{-2}$

127. The density of a gas A is twice that of a gas B at the same temperature. The molecular weight of gas B is thrice that of A. The ratio of the pressures acting on A and B will be :

(1) 1 : 6 (2) 7 : 8 (3) 2 : 5 (4) 1 : 4

128. In the corrections made to the ideal gas equation for real gases, the reduction in pressure due to attractive forces is directly proportional to :

(1) n/V (2) nb (3) n^2/V^2b (4) n^2/V^2

129. A fcc cell contains eight X atoms at the corners of the cell and six Y atoms at the faces. What is the empirical formula of the solid ?

(1) X_3Y_4 (2) X_3Y (3) XY_3 (4) X_4Y_3

130. In a reversible adiabatic change ΔS is :

(1) infinity (2) zero

(3) equal to $C_v dT$ (4) equal to $nR\mathit{l}nV_2/V_1$

131. In which of the following reactions is $\Delta H = \Delta U$

(1) $H_2(g) + I_2(g) \rightarrow 2HI(g)$

(2) $KI(aq) + I_2(s) \rightarrow KI_3(aq)$

(3) $6NaOH(aq) + 3Cl_2(g) \rightarrow 5NaCl(aq) + 5NaClO_3(aq) + 3H_2O(l)$

(4) $N_2O_4(g) \rightarrow 2NO_2(g)$

132. A plot of the Gibb's energy of a reaction -mixture against the extent of the reaction is :

(1) minimum at equilibrium

(2) zero at equilibrium

(3) equal to $(\Delta H - T\Delta S)$ at equilibrium

(4) maximum at equilibrium

133. An ideal liquid solution has equal mole fractions of two volatile components A and B of different vapour pressures $\left(P_A^0 > P_B^0\right)$. In the vapour phase above the solution, the mole fractions of A and B respectively are :

(1) $X_A = X_B = 0.5$ (2) $X_A = X_B \neq 0.5$ (3) $X_A > X_B$ (4) $X_A < X_B$

134. When the temperature is increased, surface tension of water :

(1) increases (2) decreases

(3) remains constant (4) shows irregular behaviour

135. Which of the following can act as a Brönsted acid but not as a Lewis acid ?

(1) OH^- (2) $AlCl_3$ (3) $FeCl_3$ (4) NH_3

136. Among the following, the strongest conjugate base is :

(1) NO_3^- (2) Cl^- (3) SO_4^{2-} (4) CH_3COO^-

137. The zero point energy of a harmonic oscillator is :

(1) $h\nu$ (2) zero (3) $\frac{1}{2} h\nu$ (4) $\frac{3}{2} h\nu$

138. Which of the following transitions has the highest energy ?

(1) $n \rightarrow \sigma^*$ (2) $n \rightarrow \pi^*$ (3) $\sigma \rightarrow \sigma^*$ (4) $\pi \rightarrow \pi^*$

139. The m/z value for M^+ fragment in butanal is :

(1) 70 (2) 72 (3) 56 (4) 75

140. Which of the following molecular species will show ESR spectrum ?

(1) N_2 (2) F_2 (3) O_2^- (4) O_2^{2-}

141. The number of lines the ESR spectrum of benzene cation will show :

(1) 1 (2) 2 (3) 6 (4) 7

142. Among the following transitions which one is fluorescence ?

(1) $T_1 \rightarrow S_0 + hv$ (2) $S_1 \rightarrow T_1$ (3) $T_1 \rightarrow T_0 + hv$ (4) $T_1 \rightarrow T_0$ + heat

143. A reaction $2A \rightarrow P$ follows II order kinetics. A straight line is obtained by plotting time t against :

(1) $[A]^2$ (2) [A] (3) log[A] (4) 1/[A]

144. At constant pressure, upon the addition of helium at the equilibrium point in the reaction $PCl_5(g) \leftrightarrow PCl_3 + Cl_2(g)$, the degree of dissociation of :

(1) PCl_5 will decrease (2) PCl_5 will increase

(3) PCl_3 will increase (4) Cl_2 will increase

145. Which of the following equations is valid for a reversible process in a state of equilibrium ?

(1) $\Delta G = -RT\ ln K_p$ (2) $\Delta G = RT\ ln K_p$ (3) $\Delta G^0 = -RT\ ln K_p$ (4) $\Delta G^0 = RT\ ln K_p$

146. Equal weights of ethane and hydrogen are mixed in an empty vessel at 25°C. The fraction of total pressure exerted by hydrogen is :

(1) $1/2$ (2) $1/4$ (3) $1/16$ (4) $15/16$

147. The H^+ ion concentration in a solution prepared by mixing 50 mL of 0.20 M NaCl, 25 mL of 0.10 M NaOH and 25 mL of 0.30 M HCl will be :

(1) 0.5 M (2) 0.05 M (3) 0.02 M (4) 0.0 M

148. X and Y are two elements which form X_2Y_3 and X_3Y_4. If 0.20 mol of X_2Y_3 weighs 32.0 g and 0.4 mol of X_3Y_4 weighs 92.8 g, the atomic weights of X and Y are respectively :

(1) 16.0 and 56.0 (2) 8.0 and 28.0 (3) 56.0 and 16.0 (4) 28.0 and 8.0

149. If the voltage across the electrode is 1 V, then $c\left(\lambda_0^+ + \lambda_0^-\right)$ represents the :

(1) current (2) molar conductance

(3) conductance (4) ionic mobility

150. If a solute undergoes dimerization and trimerization, the minimum values of the van't Hoff factors is :

(1) 0.50 and 1.50 (2) 1.50 and 1.33 (3) 0.50 and 0.33 (4) 0.25 and 0.67

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