MIZORAM PUBLIC SERVICE COMMISSION

Technical Competitive Examinations for Recruitment to the post of <u>Inspector of Legal Metrology</u> under Food, Civil Supplies & Consumer Affairs Department

Time Allowed : 2 hours
Full Marks : 150

<u>Chemistry Paper-II</u>

INVIGILATOR CENTRE SUPERINTENDENT

Date of Exam. : 26/03/2010

<u>Instructions to candidates:</u>

- Enter your Roll No. in the box provided on the front page.
- Attempt all the questions.
- Each question is followed by probable answers. Choose the appropriate answer and mark it by putting '✓' mark on the corresponding box.
- If more than one answer boxes are marked for a question, the answer will be treated as wrong.
- On completion, you are to submit the booklet to the Invigilator.

Code Number : .....
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Marks Obtained : .....

Examiner Scrutiniser

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1. Which of the following is an electrophile?

(a) CH_3O^- ☐ (b) $CH_3CH_2^+$ ☐

(c) NH_3 ☐ (d) $CH_3^-CH_2^-$ ☐

2. Which alkyl free radical is the most stable?

(a) Methyl ☐ (b) Primary ☐

(c) Secondary ☐ (d) Tertiary ☐

3. Which of the following statement is correct regarding nucleophiles?

(a) They have an overall positive charge . ☐ (b) They have a lone pair of electrons .... ☐

(c) They have an unpaired electron ..... ☐ (d) They have empty orbitals ..... ☐

4. An organic compound shows strong broad absorbtion at 3200-3500 cm^{-1} the compound is

(a) ethyl alcohol ☐ (b) diethyl ether ☐

(c) ethane ☐ (d) butane ☐

5. When the rate of an elimination reaction depends upon the concentration of a substrate and the nucleophile it is represented as a

(a) E1 ☐ (b) E2 ☐

(c) SN^1 ☐ (d) SN^2 ☐

6. Propene reacts with HBr in the presence of a peroxide gives

(a) *n*-propyl bromide ☐ (b) allyl bromide ☐

(c) iso propyl bromide ☐ (d) vinyl bromide ☐

7. In the reactions of aldehydes and ketones the carbonyl carbon is mostly attacked by

(a) Electrophiles ☐ (b) Free radicals ☐

(c) Nucleophiles ☐ (d) Carbenes ☐

8. An inorganic polymer amongst the following is

(a) $B_3N_3H_3$ ☐ (b) $B_3N_3H_6$ ☐

(c) $B_6N_3H_6$ ☐ (d) $B_3N_6H_3$ ☐

9. Borazine can be prepared by heating diborane with

(a) NH_3 ☐ (b) H_2O ☐

(c) CCl_4 ☐ (d) PCl_5 ☐

10. Zeigler-Natta catalyst is

(a) $K[Pt\,Cl_3(C_2H_4)]$ ☐ (b) $(Pb_3P)_3\,RhCl$ ☐

(c) $Al_2(C_2H_5)_6 + TiCl_4$ ☐ (d) $Fe(C_5H_5)_2$ ☐

11. A nucleoplilic reagent will readily attack

(a) Ethylene ..... ☐ (b) Ethanal ..... ☐

(c) Ethanol ..... ☐ (d) Ethyl amine ..... ☐

12. Pinacolone is

(a) 2,3-Dimethyl-2,3-butanediol ..... ☐ (b) 3,3-Dimethyl-2-butanone ..... ☐

(c) 1-Phenyl-2-propanone ..... ☐ (d) 1,1-Diphenyl-1, 2-ethanediol ..... ☐

13. A reagent used for Cis-hydroxylation of double bond is

(a) OsO_4 ..... ☐ (b) $LiAlH_4$ ..... ☐

(c) $NaNH_2$ ..... ☐ (d) KOH ..... ☐

14. The reaction of H_2C=CHBr with sodamide gives

(a) Acetylene ..... ☐ (b) Ethane ..... ☐

(c) Ethene ..... ☐ (d) None of these ..... ☐

15. Nylon-6 is made from

(a) 1,3-Butadiene ..... ☐ (b) Chloroprene ..... ☐

(c) Adipic acid ..... ☐ (d) Caprolactum ..... ☐

16. The reaction which involves the acid catalysed dehydration of 1, 2-glycols followed by a rearrangement to form ketones is known as

(a) Pinacole-pinacolone rearrangement ... ☐ (b) Beckmann rearrangement ..... ☐

(c) Claisen rearrangement ..... ☐ (d) Wagner-Meerwein rearrangement ..... ☐

17. Aldol condensation provides a useful route for the preparation of

(a) a, b - unsaturated carbonyl compounds ..... ☐

(b) b, g - unsaturated carbonyl compounds ..... ☐

(c) a - keto ester ..... ☐

(d) b - keto ester ..... ☐

18. Which one of the following compound will give Cannizzaro's reaction?

(a) CH_3CHO ..... ☐ (b) $C_6H_5CH_2CHO$ ..... ☐

(c) $(CH_3)_3$ C-CHO ..... ☐ (d) CH_3CH_2CHO ..... ☐

19. An example of Perkins reaction is

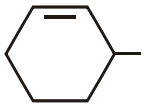
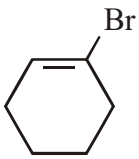
(a) $C_6H_5CHO + CH_3NO_2 \xrightarrow{KOH} C_6H_5CH = CHNO_2$ ☐

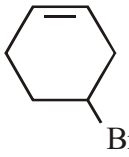
(b) $C_6H_5CHO + (CH_3CO)_2O \xrightarrow{CH_3COONa} C_6H_5CH = CHCOOH$ ☐

(c) $C_6H_5CHO + CH_3CHO \xrightarrow{NaOH} C_6H_5CH = CHCHO$ ☐

(d) $C_6H_5CHO + CH_2(COOH)_2 \xrightarrow{Alc.NH_3} C_6H_5CH = CHCO_2H$ ☐

20.  + NBS ⟶ A, A is

(a)  ☐ (b)  ☐

(c)  ☐ (d)  ☐

21. Formaldehyde reacts with NaOH (50%). Which one pair of product will be obtained?

(a) $CH_3COOH + CH_3OH$ ☐ (b) $CH_3OH + CH_3COONa$ ☐

(c) $CH_3COOH + C_2H_5OH$ ☐ (d) $HCOONa + CH_3OH$ ☐

22. The least stable carbanion is

(a) $C_6H_5\bar{C}H_2$ ☐ (b) $(CH_3)_3\bar{C}$ ☐

(c) C^-Cl_3 ☐ (d) C^-H_3 ☐

23. OsO_4 is a valuable reagent in organic synthesis. It is a

(a) reducing agent ☐ (b) oxidising agent ☐

(c) dehydrating agent ☐ (d) hydroxylating agent ☐

24. Condensation of two molecules of ethylacetate in the presence of sodium ethoxide gives ethylacetoacetic ester. This reaction is known as

(a) Claisen ester condensation ☐ (b) Aldol condensation ☐

(c) Dieckmann condensation ☐ (d) None of these ☐

25. A triplet carbene has two electrons in

(a) two different orbitals ☐ (b) same orbital ☐

(c) two different orbits ☐ (d) None of these ☐

26. The decreasing order of stability of free radical is

(a) Allyl > benzyl > tert. alkyl > prim. alkyl > sec-alkyl .....

(b) Benzyl > tert. alkyl > sec-alkyl > allyl > prim. alkyl .....

(c) Benzyl > allyl > tert. alkyl > sec-alky > priim. alkyl .....

(d) tert. alkyl > allyl > sec. alkyl > prim. alkyl > benzyl .....

27. A carbabion has

(a) SP^3-hybrid carbon .....

(b) SP^2-hybrid carbon .....

(c) SP-hybrid carbon .....

(d) dSP^2-hybrid carbon .....

28. Nitrene can be detected by which one of the following spectroscopic method?

(a) ESR .....

(b) IR .....

(c) NMR .....

(d) UV-VIS .....

29. What will be the $\diagdown\!\!\diagup C = O$ stretching band in IR of $H_2C{=}CHCOCH_3$ compound?

(a) 1700 cm^{-1} .....

(b) 1710 cm^{-1} .....

(c) 1680 cm^{-1} .....

(d) 1780 cm^{-1} .....

30. Which proton of $Br_2CH\text{-}CH_2Br$ give triplet splitting in NMR

(a) $\diagdown\!\!\diagup C - H$ .....

(b) $- CH_2$ .....

(c) Both of these .....

(d) None of these .....

31. Which one of the following primary alkyl bromide give nucleophilic substitution by SN^I mechanism?

(a) $(CH_3)_3\, C\, CH_2Br$ .....

(b) CH_3CH_2Br .....

(c) CH_3Br .....

(d) $CH_3CH_2CH_2Br$ .....

32. Acetic acid undergoes reduction with $LiAlH_4$ to give

(a) Ethanol .....

(b) Ethane .....

(c) Ethanal .....

(d) Ethyne .....

33. The chlorination of methane in the presence of ultraviolet light is an example of

(a) Electrophilic substitution .....

(b) Nucleophilic substitution .....

(c) free-radical substitution .....

(d) Nucleophilic addition .....

34. Perkin reaction is a reaction related to

(a) Cannizzaro's reaction .....

(b) Aldol condensation .....

(c) Witting reaction .....

(d) Reimer-Tiemann reaction .....

35. The hydrogen on carbon alpha to carbonyl groups are

(a) neutral ☐ (b) acidic ☐

(c) amphoteric ☐ (d) basic ☐

36. Which of the following compounds has the highest λ_{max} in the UV spectrum?

(a) Acetic acid ☐ (b) Benzoic acid ☐

(c) I-Naphthoic acid ☐ (d) Malonic acid ☐

37. The molecule which is IR-inactive but Raman-active is

(a) HCI ☐ (b) N_2 ☐

(c) SO_2 ☐ (d) HBr ☐

38. Reformatsky reaction consists in reacting aldehydes and ketones with a-bromoesters in the presence of

(a) Magnesium ☐ (b) Zinc ☐

(c) Cadmium ☐ (d) Zinc amalgam ☐

39. Phosphonitrilic chloride is obtained by the reaction of NH_4Cl with

(a) PCl_5 ☐ (b) PCl_3 ☐

(c) H_3PO_4 ☐ (d) P_4 ☐

40. The hydrolysis of neopentyl bromide to give 2-methyl-2-butanol is governed by

(a) Beckmann rearrangement ☐ (b) Pinacole-Pinacolone rearrangement ☐

(c) Wagner-Meerwein rearrangement ☐ (d) Fries rearrangement ☐

41. Pinacole-Pinacolone rearrangement takes place through the formation of intermediate

(a) carbanion ☐ (b) carbocation ☐

(c) free radical ☐ (d) carbene ☐

42. The spectra which corresponds to the wave number 50,000 cm^{-1} is

(a) NMR ☐ (b) Visible ☐

(c) Microwave ☐ (d) UV ☐

43. Friedel-Crafts reaction of bromo benzene with methyl iodide gives

(a) O–Bromotoluene ☐ (b) p–Bromotoluene ☐

(c) O– and p–Bromotoluene ☐ (d) m–Bromotoluene ☐

44. In SN^1 reaction the first step involves the formation of

(a) Free radical ..... (b) Carbanion .....

(c) Carbocation ..... (d) Carbene .....

45. The reaction of $C_6H_5CH=CHCHO$ with $NaBH_4$ gives

(a) $C_6H_5CH_2CH_2CH_2OH$ ..... (b) $C_6H_5CH=CHCH_2OH$ .....

(c) $C_6H_5CH_2CH_2CHO$ ..... (d) $C_6H_5CH_2CHOHCH_3$ .....

46. The nucleoplilic addition reactions of carbonyl compounds are catalysed by

(a) acids ..... (b) bases .....

(c) ampholytes ..... (d) water .....

47. Approximate position of the characteristic infrared band in CH_3COCH_3 is

(a) 3030 cm^{-1} ..... (b) 900 cm^{-1} .....

(c) 1710 cm^{-1} ..... (d) 680 cm^{-1} .....

48. Terylene is made by polymerisation of terephthalic acid with

(a) Ethylene glycol ..... (b) Phenol .....

(c) Ethanol ..... (d) Catechol .....

49. Inorganic benzene is

(a) $B_3N_3H_6$ ..... (b) C_6H_6 .....

(c) $(PNCl_2)_X$ ..... (d) B_4Cl_4 .....

50. Soft drink bottles are generally made up of

(a) polyester ..... (b) polystyrene .....

(c) polyamide ..... (d) polymethane .....

51. ESR spectra are observed in the region

(a) radiofrequency ..... (b) UV .....

(c) visible ..... (d) microwave .....

52. Perkin reaction involves the addition of acid anhydrides to which type of aldehydes in the presence of the sodium salt of the acid from which the anhydride is derived?

(a) Aliphatic ..... (b) Aromatic .....

(c) Alicyclic ..... (d) All of these .....

53. Reformatsky reaction provides a suitable route for the preparation of

(a) a-hydroxy esters ..... (b) b-hydroxy esters .....

(c) Tertiary alcohol ..... (d) Secondary alcohol .....

54. $H_2C = CH\text{-}CHO + H_2C(COOC_2H_5)_2 \xrightarrow{C_2H_5ONa} \begin{matrix} CH_2CH_2CHO \\ | \\ CH(COOC_2H_5)_2 \end{matrix}$

The above reaction is an example of

(a) Michael addition ..... ☐ (b) Aldol condensation ..... ☐

(c) Elimination reaction ..... ☐ (d) Perkin reaction ..... ☐

55. Claisen condensation of esters is catalysed by

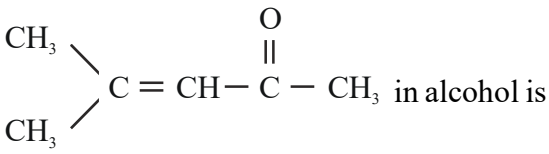
(a) acid ..... ☐ (b) base ..... ☐

(c) water ..... ☐ (d) Zn ..... ☐

56. Cyclisation of alphatic dicarboxylic ester to 2-carbalkoxy cycloalkanone in the presence of a base is known as

(a) Perkin reaction ..... ☐ (b) Reformatsky ..... ☐

(c) Dickmann condensation ..... ☐ (d) Aldol condensation ..... ☐

57. The absorption maxima (λ_{max}) of the compound  in alcohol is

(a) 349 nm ..... ☐ (b) 239 nm ..... ☐

(c) 217 nm ..... ☐ (d) 227 nm ..... ☐

58. Extremely short lived (transient) free radical intermediates in chemical reactions can be delected by the spectroscopic technique

(a) IR ..... ☐ (b) NMR ..... ☐

(c) ESR ..... ☐ (d) UV ..... ☐

59. A neutral species in which the carbon atom has six electrons in the valence shell of which two are shared is

(a) carbanion ..... ☐ (b) carbocation ..... ☐

(c) carbene ..... ☐ (d) free radical ..... ☐

60. The decreasing order of stability of alkyl cations is

(a) Tertiary > Secondary > Primary > Methyl ..... ☐

(b) Methyl > Primary > Secondary > Tertiary ..... ☐

(c) Primary > Methyl > Secondary > Tertiary ..... ☐

(d) Methyl > Primary > Tertiary > Secondary ..... ☐

61. Reimer-Tiemann reaction proceeds through the formation of intermediate

(a) carbocation ..... (b) carbanion .....

(c) carbene ..... (d) free radical .....

62. Aldoxime when treated with concentrated H_2SO_4 gives amide. This is

(a) Friedel-Craft reaction ..... (b) Dieckmann reaction .....

(c) Beckmann rearrangement ..... (d) Pericyclic reaction .....

63. Cannizzaro's reaction is an example of

(a) Disproportion action reaction ..... (b) Substitution reaction .....

(c) Elimination reaction ..... (d) Addition reaction .....

64. Which one is the basic value of λ_{max} of conjugated diene?

(a) 215 ..... (b) 217 .....

(c) 214 ..... (d) 253 .....

65. Which one of the following regions in IR is the functional group region?

(a) 1300-4000 cm^{-1} ..... (b) 900-1300 cm^{-1} .....

(c) 650-900 cm^{-1} ..... (d) 180-650 cm^{-1} .....

66. Spectroscopy based on the magnetic properties of the nucleus of atom is

(a) IR ..... (b) UV .....

(c) NMR ..... (d) MS .....

67. The number of lines present in the ESR spectrum of anthracene radical anion is

(a) 25 ..... (b) 40 .....

(c) 50 ..... (d) 75 .....

68. Raman effect is

(a) absorption of light ..... (b) emission of light .....

(c) elastic scattering of light ..... (d) inelastic scattering of light .....

69. The photon of wave length 400nm corresponds to

(a) 20,000 cm^{-1} ..... (b) 25,000 cm^{-1} .....

(c) 50,000 cm^{-1} ..... (d) 40,000 cm^{-1} .....

70. Which of the following molecules will not show a pure rotational spectrum?

(a) H_2 ..... (b) HCl .....

(c) CO ..... (d) CH_3Cl .....

71. Silicon is a

(a) co-ordination polymer ☐ (b) electron deficient polymer ☐

(c) condensation polymer ☐ (d) addition polymer ☐

72. In the preparation of polystyrene the catalyst used is

(a) Acid ☐ (b) Base ☐

(c) Sodium ☐ (d) Peroxide ☐

73. Which of the following change is known as intersystem crossing

(a) S_1 ® So ☐ (b) S_2 ® S_1 ☐

(c) S_1 ® T_1 ☐ (d) T_2 ® T_1 ☐

74. The compound that give single NMR signal due to equivalent protons is

(a) $H_3C\text{-}O\text{-}CH_3$ ☐ (b) $CH_3CH_2OCH_3$ ☐

(c) $CH_3\ COOCH_3$ ☐ (d) $CH_2{=}CHCl$ ☐

75. In an organic compound H-bonding causes in the IR spectrum shifts to

(a) Lower wave number value ☐ (b) Higher wave number value ☐

(c) No change in position ☐ (d) None of these ☐

76. An alkyne with molecular formula C_5H_8 shows IR bands at 3300 cm^{-1} and 2110 cm^{-1}. The structure of the alkyne is

(a) HC ° $C\text{-}CH_2CH_2CH_3$ ☐ (b) $H_3C\text{-}C$ ° $C\text{-}CH_2CH_3$ ☐

(c) $H_3C\text{-}CH_2\text{-}C$ ° $C\text{-}CH_3$ ☐ (d) $H_2C{=}CH\text{-}CH_2\text{-}CH{=}CH_2$ ☐

77. The bromination of benzene in the presence of $FeBr_3$ is an example of

(a) Free radical subtitution ☐ (b) Electrophilic substitution ☐

(c) Nucleophilic substitution ☐ (d) Electrophilic addition ☐

78. Which of the following is a nucleophile?

(a) $AlCl_3$ ☐ (b) H_3O^+ ☐

(c) BF_3 ☐ (d) CN^- ☐

79. Hydration of 2-methyl-1-propene with (H_2O/H_2SO_4) gives

(a) $CH_3CH_2CH_2OH$ ☐ (b) $(CH_3)_3COH$ ☐

(c) $CH_3CH_2CH_2CH_2OH$ ☐ (d) $(CH_3)_2CHOH$ ☐

80. The starting material for the preparation of silicon can be

(a) Silicates ☐ (b) Silanols ☐

(c) Silica ☐ (d) Silicon tetrachloride ☐

81. S_N^2 mechanism proceeds through the intervention of

(a) carbonium ion ☐ (b) free radical ☐

(c) carbanion ☐ (d) transition state ☐

82. Which one of the following excited state have a long life?

(a) S_1 ☐ (b) S_2 ☐

(c) T_1 ☐ (d) T_2

83. How many types of electronic transition is/are possible in visible and UV region?

(a) Two ☐ (b) Three ☐

(c) One ☐ (d) Four ☐

84. The addition of HBr to ethylene is an example of

(a) Nucleophilic addition ☐ (b) Electrophilic addition ☐

(c) Nucleophilic substitution ☐ (d) Electrophilic substitution ☐

85. The reduction of $C_6H_5CH{=}CHCHO$ with $LiAlH_4$ give

(a) $C_6H_5\,CH_2CH_2\,CH_2OH$ ☐ (b) $C_6H_5\,CH{=}CH\,CH_2OH$ ☐

(c) $C_6H_5\,CH_2CH_2CHO$ ☐ (d) $C_6H_5\,CH_2\,CHOH\,CH_3$ ☐

86. The absorbtion maxima (λ_{max}) of the compound  is

(a) 217 nm ☐ (b) 248 nm ☐

(c) 232 nm ☐ (d) 253 nm ☐

87. The number of proton signals present in the NMR spectra of CH_3-O-CH_2CH_3 is

(a) One ☐ (b) Three ☐

(c) Two ☐ (d) Four ☐

88. A sample was excited by the 4358Å line of mercury. A Raman line was observed at 4447Å. The Raman shift is equal to

(a) 560 cm^{-1} ☐ (b) 460 cm^{-1} ☐

(c) 390 cm^{-1} ☐ (d) 200 cm^{-1} ☐

89. How many kinds of protons are there in $CH_3CH_2CH_3$?

(a) One ☐ (b) Two ☐

(c) Three ☐ (d) Four ☐

90. The spectra that can distinguish protons in different environment is

(a) NMR ☐ (b) ESR ☐

(c) IR ☐ (d) UV-Visible ☐

91. Rotational spectra occur in the spectral range of

(a) 500 - 4000 cm^{-1} ☐ (b) 1 - 100 cm^{-1} ☐

(c) 180 - 4000cm^{-1} ☐ (d) 12,500 - 25,000cm^{-1} ☐

92. Formaldehyde when treated with KOH gives methanol and potassium formate. The reaction is known as

(a) Perkin reaction ☐ (b) Claisen reaction ☐

(c) Cannizzaro's reaction ☐ (d) Kolbe's reaction ☐

93. Tertiary alcohols can be prepared by the reaction of Grignard reagent with

(a) Aldehyde ☐ (b) Alcohol ☐

(c) Ketone ☐ (d) Amine ☐

94. $H_2C = CH - CHO \xrightarrow[(ii)\ H_2O]{(i)\ OsO_4}$ A, A is

(a) H_2C=CH-CH_2OH ☐ (b) CH_3-CH_2-CHO ☐

(c) HO-CH_2-CH(OH)-CHO ☐ (d) HOH_2C-CH_2-CHO ☐

95. Which of the following is not a nucleophile?

(a) NH_3 ☐ (b) HSO_3^- ☐

(c) $AlCl_3$ ☐ (d) OH^- ☐

96. 2-Methyl-2-butene reacts with HBr in the presence of peroxide gives

(a) A primary alkyl bromide ☐ (b) A secondary alkyl bromide ☐

(c) A tertiary alkyl bromide ☐ (d) A vicinal dibromide ☐

97. 2-Butene reacts with HBr to give

(a) 1-Bromo butane ☐ (b) 2, 3-Dimethyl-2-butane ☐

(c) 2-Bromo butane ☐ (d) None of these ☐

98. Acetone reacts with HCN to form a cyanohydrin. It is an example of

(a) Electrophilic addition ☐ (b) Electrophilic substitution ☐

(c) Nucleophilic addition ☐ (d) Nucleophilic substitution ☐

99. Which of the polymer contain nitrogen?

(a) PVC ..... ☐ (b) Teflon ..... ☐

(c) Nylon ..... ☐ (d) Terylene ..... ☐

100. In Cannizzaro's reaction aldehyde molecules undergo

(a) Oxidation only ..... ☐ (b) Reduction only ..... ☐

(c) Both self oxidation and reduction ..... ☐ (d) Decomposition ..... ☐

101. The decreasing order of stability of carbanion is

(a) Benzyl > diphenyl methyl > triphenyl methyl ..... ☐

(b) Diphenyl methyl > benzyl > triphenyl methyl ..... ☐

(c) Triphenyl methyl > diphenyl methyl > benzyl ..... ☐

(d) Triphenyl methyl > benzyl > diphenyl methyl ..... ☐

102. Which of the following will react according to SN^2 as well as SN^1 mechanism?

(a) CH_3CH_2Cl ..... ☐ (b) $(CH_3)_2CHCl$ ..... ☐

(c) $(CH_3)_3CCl$ ..... ☐ (d) $CH_3CH_2CH_2Cl$ ..... ☐

103. Addition of HBr to an unsymmetric alkene takes place in the presence of peroxide by

(a) Nucleophilic addition ..... ☐ (b) Free radical addition ..... ☐

(c) Electrophilic addition ..... ☐ (d) None of these ..... ☐

104. The order of reactivities of the following alkyl halides for SN^2 reaction is

(a) RF > RCl > RBr > RI ..... ☐ (b) RF > RBr > RCl > RI ..... ☐

(c) RCl > RBr > RF > RI ..... ☐ (d) RI > RBr > RCl > RF ..... ☐

105. Which of the following compounds will not give Cannizzaro's reaction?

(a) CH_3CHO ..... ☐ (b) HCHO ..... ☐

(c) Me_3CCHO ..... ☐ (d) C_6H_5CHO ..... ☐

106. The rotational spectrum of a rigid diatomic rotor consists of equally spaced lines with sparing equal to

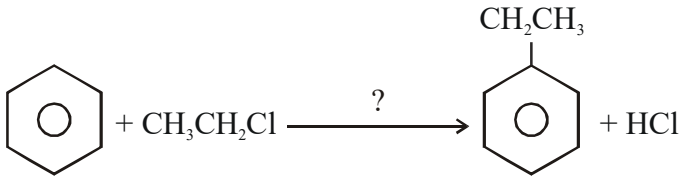
(a) B ..... ☐ (b) 2B ..... ☐

(c) B/2 ..... ☐ (d) 3B/2 ..... ☐

107. $RCH = CHR^1 \xrightarrow[(ii)\ H_2O]{(i)\ OsO_4}$ X, X is

(a) $RCH_2 = CH_2R^1$ ..... ☐ (b) $R = \underset{OH}{CH} - \underset{OH}{CH} - R^1$ ..... ☐

(c) $R\,\underset{O}{C} - \underset{O}{C} - R^1$ ..... ☐ (d) $R - \underset{O}{C} - \underset{OH}{CH} - R^1$ ..... ☐

108.  + $CH_3CH_2Cl \xrightarrow{?}$ + HCl

The catalyst used to complete the above reaction is

(a) $LiAlH_4$ ..... ☐ (b) $AlCl_3$ ..... ☐

(c) Na ..... ☐ (d) KOH ..... ☐

109. In the chlorination of benzene $Fecl_3$ is used to generate

(a) Cl^- ..... ☐ (b) Cl^+ ..... ☐

(c) Cl_2 ..... ☐ (d) HCl ..... ☐

110. Benzene reacts with concentrated HNO_3 in the presence of concentrated H_2SO_4 to give nitrobenzene. This reaction is an example of

(a) Electrophilic addition ..... ☐ (b) Nucleophilic addition ..... ☐

(c) Electrophilic substitution ..... ☐ (d) Nucleophilic substitution ..... ☐

111. Aryl halides are less reactive towards nucleophilic substitution as comparred to aklyl halides due to

(a) Inductive effect ..... ☐ (b) Resonance stabilization ..... ☐

(c) Tautomerism ..... ☐ (d) Stereoisomerism ..... ☐

112. Which of the compounds may exist as cis-trans isomers?

(a) 1-Butene ..... ☐ (b) 2-Butene ..... ☐

(c) Cyclopropane ..... ☐ (d) Acetone ..... ☐

113. The reaction

$CH_3CH = CH_2 + Cl_2 \xrightarrow{500 - 600^oC}$ product

The product is

(a) $Cl\,CH_2CH{=}CH_2$ ..... ☐ (b) $CH_3\text{-}CH{=}CCl_2$ ..... ☐

(c) $CH_3CH\text{-}CH_2Cl$ ..... ☐ (d) $CH_3\text{-}CCl{=}CH_2$ ..... ☐

114. Chlorobenzene reacts with CH_3CN in $NaNH_2$ and ammonia to form benzyl cyanide. This reaction proceeds via the formation of intermediate

(a) Phenyl cation ☐ (b) Benzyne ☐

(c) Phenyl anion ☐ (d) Carbene ☐

115. Acetic acid in CCl_4 gives a broad and intense -OH stretching band at

(a) 3500 cm^{-1} ☐ (b) 3000 cm^{-1} ☐

(c) 1250 cm^{-1} ☐ (d) 1700 cm^{-1} ☐

116. Which of the following is the C ° C stretching for internal alkyne?

(a) 2100 - 2150 cm^{-1} ☐ (b) 2200 - 2250 cm^{-1} ☐

(c) 790 - 840 cm^{-1} ☐ (d) 910 - 990 cm^{-1} ☐

117. A diene C_4H_6 has an intense peak at 217 nm in its UV spectrum. Its structure is

(a) CH_2=CH-CH=CH_2 ☐ (b) CH_3-CH=C=CH_2 ☐

(c) CH_3-HC=CH-CH_3 ☐ (d) CH_2=C=CH-CH_3 ☐

118. Homolytic fission of C-C bond leads to the formation of

(a) Carbocation ☐ (b) Carbanion ☐

(c) Free radical ☐ (d) Carbene ☐

119. Which of the following reacts fastest with N-bromo Succinimide?

(a) C_6H_6 ☐ (b) CH_4 ☐

(c) C_2H_6 ☐ (d) C_6H_5-CH_3 ☐

120. Tertiary alkyl halides are inert to subtitution by SN^2 mechanism because of

(a) Insolubility ☐ (b) Instability ☐

(c) Inductive effect ☐ (d) Steric hindrance ☐

121. Among the following the strongest nucleophile is

(a) C_2H_5SH ☐ (b) CH_3COO^- ☐

(c) CH_3NH_2 ☐ (d) $NCCH_2^-$ ☐

122. Chlorination of toluene in presence of light and heat followed by treatment with aqueous NaOH gives

(a) O-Cresol ☐ (b) p-Cresol ☐

(c) Benzoic acid ☐ (d) 1, 3, 5-trihydroxytoluene ☐

123. The addition of propene with HOCl proceeds via the addition of

(a) H^+ in the first step ☐ (b) Cl^+ in the first step ☐

(c) OH^- in the first step ☐ (d) Cl^+ and OH^- in a single step ☐

124. $C_6H_5CONHCH_3$ can be converted into $C_6H_5CH_2NHCH_3$ by

(a) $NaBH_4$ ☐ (b) H_2-Pd/C ☐

(c) $LiAlH_4$ ☐ (d) Zn-Hg/HCl ☐

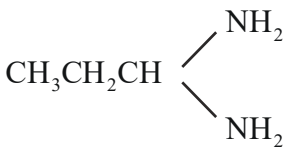
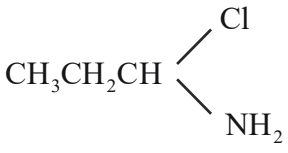
125. 2-Hexyne gives trans-2-hexene on treatment with

(a) Li/NH_3 ☐ (b) $Pd/BaSO_4$ ☐

(c) $LiAlH_4$ ☐ (d) Pt/H_2 ☐

126. When $CH_3CH_2CHCl_2$ is treated with $NaNH_2$ the product formed is

(a) $CH_3CH=CH_2$ ☐ (b) CH_3-C°CH ☐

(c)  ☐ (d)  ☐

127. Anti-Markownikov's addition of HBr is not observed in

(a) Propene ☐ (b) But-1-ene ☐

(c) But-2-ene ☐ (d) Pent-2-ene ☐

128. 1-Chlorobutane on reaction with alcoholic potash gives

(a) 1-Butene ☐ (b) 1-Butanol ☐

(c) 2-Butene ☐ (d) 2-Butanol ☐

129. In Friedel-crafts synthesis of toluene, reactants in addition to anhydrous $AlCl_3$ are

(a) $C_6H_6+CH_4$ ☐ (b) $C_6H_6+CH_3Cl$ ☐

(c) $C_6H_5Cl+CH_3Cl$ ☐ (d) $C_6H_5Cl+CH_4$ ☐

130. The correct order of reactivity towards the electrophilic substitution of the compounds aniline (I), benzene (II) and nitrobenzene (III) is

(a) III > II > I ☐ (b) II> III > I ☐

(c) I < II > III ☐ (d) I > II > III ☐

131. Photochemical chlorination is initiated by a process of

(a) Pyrolysis ☐ (b) Substitution ☐

(c) Homolysis ☐ (d) Peroxidation ☐

132. When 2-Butyne is treated with H_2 in presence of Pd-$BaSO_4$ th product formed will be

(a) Cis-2-butene ☐ (b) trans-2-butene ☐

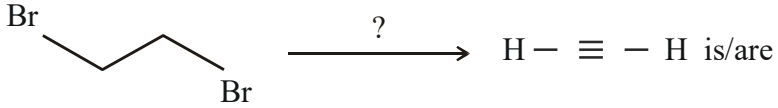
(c) 1-butene ☐ (d) 2-hydroxybutane ☐

133. The order of decreasing reactivity towards an electrophilic reagent for the following
(i) Benzene (ii) Toluene (iii) Chlorobenzoic acid (iv) Phenol would be

(a) (iv) > (ii) > (i) > (iii) ☐ (b) (i) > (ii) > (iii) > (iv) ☐

(c) (ii) > (iv) > (i) > (iii) ☐ (d) (iv) > (iii) > (ii) > (i) ☐

134. The reagents for the following conversion



is/are

(a) alcoholic KOH ☐ (b) alcoholic KOH followed by $NaNH_2$ ☐

(c) aqueous KOH followed by $NaNH_2$ ☐ (d) Zn/CH_3OH ☐

135. Presence of a nitro group in benzene ring

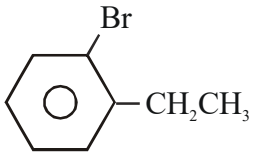
(a) deactivates the ring towards electrophilic substitution ☐

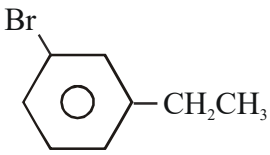
(b) activates the ring towards electrophilic substitution ☐

(c) renders the ring basic ☐

(d) deactivates the ring towards nucleophilic substitution ☐

136. Ethyl benzene with bromine in presence of $FeBr_3$ predominantly gives

(a) 

☐ (b) 

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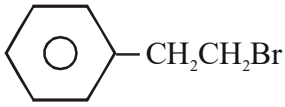
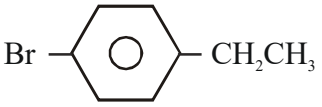
(c) 

☐ (d) 

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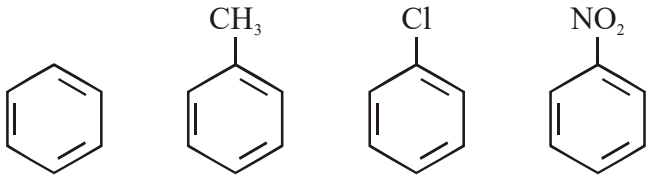
137. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds



1 2 3 4

(a) 1 > 2 >3 > 4 ☐ (b) 4 > 3 > 2 > 1 ☐

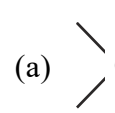
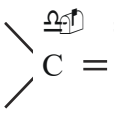
(c) 2 > 1 > 3 > 4 ☐ (d) 2 > 3 > 1 > 4 ☐

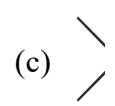
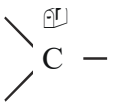
138. Which of the following species participate in sulphonation of benzene ring?

(a) H_2SO_4 ☐ (b) SO_3 ☐

(c) HSO_3 ☐ (d) SO_2^- ☐

139. Which of the following is the correct charge distribution on a carbonyl group?

(a)  ☐ (b)  ☐

(c)  ☐ (d)  ☐

140. The addition of Grignard reagent CH_3MgBr to acetaldehyde is a nucleophilic addition reaction. The electrophile in this reaction is

(a) CH_3CHO ☐ (b) CH_3^+ ☐

(c) CH_3^- ☐ (d) Br^- ☐

141. Using C_6H_5MgBr which substrate would lead to $(C_6H_5)_3$ COH?

(a) Benzaldehyde ☐ (b) Acetophenone ☐

(c) Benzophenone ☐ (d) Benzyl alcohol ☐

142. Benzene reacts with CH_3COCl in the presence of $AlCl_3$ to give

(a) C_6H_5COCl ☐ (b) C_6H_5Cl ☐

(c) $C_6H_5CH_3$ ☐ (d) $C_6H_5COCH_3$ ☐

143. The correct order of reactivity of  group in the following compound is

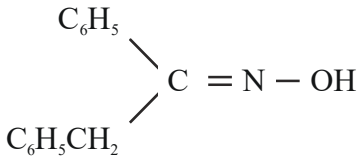
(a) $CH_3CHO > (CH_3)_2CO > C_2H_5COCH_3$ ☐

(b) $C_2H_5COCH_3 > (CH_3)_2CO < CH_3CHO$ ☐

(c) $(CH_3)_2 CO > CH_3CHO > C_2H_5COCH_3$ ☐

(d) $(CH_3)_2CO > C_2H_5COCH_3 > CH_3CHO$ ☐

144. Beckmann transformation of

 followed by hydrolysis will yield

(a) Benzoic acid + benzyl amine ☐ (b) Phenyl acetic acid + benzyl amine ☐

(c) Ailine + phenyl acetic acid ☐ (d) Benzoic acid + aniline ☐

145. Consider the following compounds

I HCHO II CH_3CHO III CH_3COCH_3

The reactivities of these compounds are such that

(a) III > II > I ☐ (b) I > II > III ☐

(c) III > I > II ☐ (d) II > III > I ☐

146. Which of the following reagents can be used to convert primary amides into primary amines containing the same number of carbon atoms?

(a) Br_2 + NaOH ..... ☐ (b) $LiAlH_4$ ..... ☐

(c) Sn + HCl ..... ☐ (d) $Na + C_2H_5OH$ ..... ☐

147. Sigmatropic rearrangement is the rearrangement of

(a) s bonds ..... ☐ (b) Electrons ..... ☐

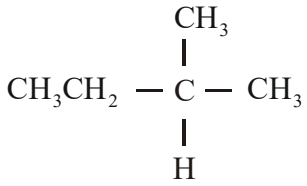
(c) Protons ..... ☐ (d) p bond ..... ☐

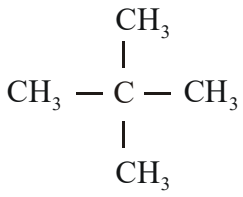
148. The molecule which do not show vibrational spectra is

(a) CH_3Cl ..... ☐ (b) H_2O ..... ☐

(c) H_2 ..... ☐ (d) NH_4Cl ..... ☐

149. An alkane with the molecular formula C_5H_{12} shows lR bands at 2900 cm^{-1}, 1375 cm^{-1} (doublet and 780 cm^{-1}). It shows a series of bands in the region 900-1300 cm^{-1}. The structure of the alkane is

(a)  ..... ☐ (b) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$ ..... ☐

(c)  ..... ☐ (d) None of these. ..... ☐

150. The energy required for electronic transitions are in the order

(a) $\sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \pi^*$ ..... ☐

(b) $\pi \rightarrow \pi^* > \sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > n \rightarrow \pi^*$ ..... ☐

(c) $n \rightarrow \sigma^* > \sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \pi^*$ ..... ☐

(d) $n \rightarrow \pi^* > \sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^*$ ..... ☐

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