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A

SET-Y

PG-EE-2022

SUBJECT : Chemistry

11473

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

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1. The strength of pπ-dπ bonding in A–O (A = Si, P, S, C) follows the order :

   (1) Si – O > P – O > S – O > Cl – O

   (2) P – O > Si – O > S – O > Cl – O

   (3) S – O > Cl – O > P – O > Si – O

   (4) Cl – O > S – O > P – O > Si – O

2. The order of acidity in boron trihalides is :

   (1) $BF_3 > BCl_3 > BBr_3$ (2) $BBr_3 > BCl_3 > BF_3$

   (3) $BF_3 > BBr_3 > BCl_3$ (4) $BBr_3 > BF_3 > BCl_3$

3. The stable oxidation state of *Au* is :

   (1) I (2) III (3) V (4) –I

4. Xenon forms several fluorides and oxofluorides which exhibit acidic behavior. The correct sequence of descending Lewis acidity among the given species is represented by :

   (1) $XeF_6 > XeOF_4 > XeF_4 > XeO_2F_2$

   (2) $XeOF_4 > XeO_2F_2 > XeF_4 > XeF_6$

   (3) $XeF_4 > XeO_2F_2 > XeOF_4 > XeF_6$

   (4) $XeF_4 > XeF_6 > XeOF_4 > XeO_2F_2$

5. The spin only (μ_s) magnetic moment of $[CrCl_6]^{3-}$:

   (1) 3.87 BM (2) 2.84 BM (3) 6.87 BM (4) 5.20 BM

6. The total number of isomers of $Co(en)_2Cl_2$ (en = ethylenediamine) is :

   (1) 4 (2) 3 (3) 6 (4) 5

7. The tripositive lanthanides ion which does not show sharp peak in its absorption spectrum :

   (1) Ce^{3+} (2) Pr^{3+} (3) Gd^{3+} (4) Pm^{3+}

8. Among the following anions (i) CH_3^- (ii) NH_2^- (iii) OH^- (iv) F^-, the order of basicity is :

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

9. The order of polarity of NH_3, NF_3 and BF_3 is :

(1) $NH_3 < NF_3 < BF_3$
(2) $BF_3 < NF_3 < NH_3$
(3) $BF_3 < NH_3 < NF_3$
(4) $NF_3 < BF_3 < NH_3$

10. Silicates with continuous 3D framework are :

(1) Neso-Silicates
(2) Soro-Silicates
(3) Phyllo-Silicates
(4) Tecto-Silicates

11. Identify the strongest Bronsted acid :

(1) H_2SO_4 (2) CH_3COOH (3) HNO_3 (4) H_3PO_4

12. Which of the following does ***not*** give flame colourations ?

(1) Ca^{2+} (2) Na^+ (3) Cu^{2+} (4) Cd^{2+}

13. The structure of XeF_2 and XeO_2F_2 respectively are :

(1) bent, tetrahedral
(2) linear, square planar
(3) linear, see-saw
(4) bent, see-saw

14. Among the following electronic configurations, the one corresponding to the element with the highest ionization energy is :

(1) [Ne] $3s^2 3p^1$
(2) [Ar] $3d^{10} 4s^2 4p^2$
(3) [Ne] $3s^2 3p^2$
(4) [Ne] $3s^2 3p^3$

15. The reaction in which the molecules of the solvent get attached to the solute species are called :

(1) Solvation reaction
(2) Solvolytic reaction
(3) Metathetical reaction
(4) Redox reaction

16. Oxymyoglobin $Mb(O)_2$ and oxyhemoglobin $Hb(O)_2$, respectively are :

(1) paramagnetic and paramagnetic

(2) diamagnetic and diamagnetic

(3) paramagnetic and diamagnetic

(4) diamagnetic and paramagnetic

17. The ring size and the number of linked tetrahedral present in $[Si_6O_{18}]^{12-}$ are, respectively :

(1) 6 and 6 (2) 12 and 6 (3) 12 and 12 (4) 6 and 12

18. The IUPAC nomenclature of $Na[PCl_6]$ is :

(1) Sodium hexachlorophosphine (V)

(2) Sodium hexachlorophosphate (V)

(3) Sodium hexachlorophosphine

(4) Sodium hexachlorophosphite (V)

19. Coordination number and geometry of $[Ce(NO_3)_6]^{2-}$ is :

(1) 6, Octahedral (2) 12, Octahedral

(3) 8, Dodecahedral (4) 12, Icosahedral

20. Which of the following has highest lattice energy ?

(1) KF (2) NaF (3) CsF (4) RbF

21. Among the following, metal carbonyl species having highest υ_{CO} stretching frequency is :

(1) $[Mn(CO)_6]^+$ (2) $[Cr(CO)_6]$ (3) $[V(CO)_6]^-$ (4) $[Fe(CO)_4]^{2-}$

22. Glauber's salt is :

(1) $MgSO_4.7H_2O$ (2) $Na_2SO_4.10H_2O$

(3) $CuSO_4.5H_2O$ (4) $FeSO_4.7H_2O$

23. The colour of CuS is :

(1) Black (2) Yellow (3) Blue (4) White

24. A 3p atomic orbital has :

(1) one radial node and one angular node

(2) two angular nodes

(3) one angular node

(4) one radial node

25. The geometry around the central atom in the ClF_4^+ is :

(1) square planar (2) square pyramidal

(3) octahedral (4) trigonal bipyramidal

26. Which of the following ions is not expected to be coloured ?

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

27. The S and L values for ^{15}N atom respectively, are :

(1) 1/2 and 1 (2) 1/2 and 0 (3) 1 and 0 (4) 3/2 and 0

28. Chelate effect is :

(1) Predominantly due to enthalpy change

(2) Predominantly due to entropy change

(3) Independent of ring size

(4) Due to equal contribution of entropy and enthalpy change

29. The red colour of oxyhaemoglobin is mainly due to the :

(1) d-d transition

(2) Metal to ligand charge transfer transition

(3) Intraligand $\pi-\pi^*$ transition

(4) Ligand to metal charge transfer transition

30. Which of the following does not obey 18 e^- rule ?

(1) $[Cr(CO)_6]$ (2) $[Fe(CO)_5]$ (3) $[V(CO)_6]$ (4) $[Mn_2(CO)_{10}]$

31. Which of the following are arranged in order of increasing radius ?

(1) $K^+(aq) < Na^+(aq) < Li^+(aq)$

(2) $K^+(aq) < Li^+(aq) < Na^+(aq)$

(3) $Li^+(aq) < K^+(aq) < Na^+(aq)$

(4) $Na^+(aq) < Li^+(aq) < K^+(aq)$

32. The number of antibonding electrons in *NO* and *CO* according to *MO* theory are respectively :

(1) 1, 0 (2) 2, 2 (3) 3, 2 (4) 2, 3

33. Ozone present in upper atmosphere protects people on earth :

(1) due to its diamagnetic nature

(2) due to its blue colour

(3) due to absorption of radiation of wavelength at 255 nm

(4) by destroying chlorofluoro carbons

34. The temperature at which *RMS* velocity of SO_2 molecules is half that of *He* molecules at 300 K is :

(1) 150 K (2) 600 K (3) 900 K (4) 1200 K

35. The mean free path of oxygen molecules at 0°C and one atmospheric pressure will be equal to (molecular diameter of oxygen molecule is 2.0×10^{-8} cm) :

(1) 2.1×10^{-5} cm

(2) 4.2×10^{-5} cm

(3) 2.9×10^{-5} cm

(4) 1.0×10^{-8} cm

36. What will be the Vander Waal's constant b for carbon dioxide in lit mol^{-1} (given that $T_C = 304$ K and $P_C = 73$ atm) ?

(1) 0.043 (2) 2.732 (3) 0.341 (4) 4.164

37. What happens to the viscosity of liquid with the increase in temperature ?

(1) It increases

(2) It decreases

(3) It may increase or decrease

(4) No change

38. Which of the following statements is ***not*** true about smectic liquid crystals ?

(1) They have limited mobility

(2) They do not flow as normal liquids

(3) The concept of viscosity is applicable to them

(4) They show X-ray diffraction patterns

39. Rate constant of a reaction can be expressed by Arrhenius equation as : $k = Ae^{\frac{-Ea}{RT}}$. In this equation, E_a, represents :

(1) The energy above which all the colliding molecules will react

(2) The energy below which the colliding molecules will not react

(3) The total energy of the reacting molecules at a temperature T

(4) The fraction of molecules with energy greater than the activation energy

40. Which of the following statements is true in the Transition State Theory (TST) ?

(1) TST fails for some reactions at high temperature

(2) Activated complex is in quasi-equilibrium with the reactants

(3) TST is not applicable when the intermediates are very short-lived

(4) All of the above

41. Ostwald dilution law is applicable to :

(1) Strong electrolytes only (2) Weak electrolytes only

(3) non electrolytes (4) Strong as well as weak electrolytes

42. Which of the following is ***not*** a type of acidic buffer solution ?

(1) $Na_2HPO_4 + Na_3PO_4$ (2) $CH_3COOH + CH_3COONa$

(3) $H_2CO_3 + Na_2CO_3$ (4) $H_3PO_4 + NaH_2PO_4$

43. When a large ion is replaced by a small ion, the conductivity of the solution :

(1) Decreases (2) Increases

(3) Remains unchanged (4) None of the above

44. All of the following are intensive properties except :

(1) Mass (2) Viscosity (3) Density (4) Temperature

45. In an isothermal process change in internal energy :

(1) Decreases (2) Increases

(3) Remains constant (4) Becomes zero

46. The ratio of the rise in temperature of a gas when compressed adiabatically to that when compressed isothermally to the same extent is :

(1) Less than 1 (2) More than 1

(3) Equal to 1 (4) Depends on the gas

47. Three Carnot engines A, B and C have source temperatures 750 K, 700 K & 650 K and sink temperatures 400 K, 350 K & 300 K respectively. Which engine is the least efficient ?

(1) Engine A
(2) Engine B
(3) Engine C
(4) All have the same efficiencies

48. For the reaction; $SBr_4(g) \rightarrow S(g) + 2Br_2(l)$; $\Delta H^\circ = +115$ kJ and $\Delta S^\circ = +125$ J/K at 25°C. ΔG° for the reaction at 25°C will be :

(1) +152.00kJ (2) −56.75 kJ (3) +77.75 kJ (4) +37.10 kJ

49. When pressure is applied to ice $\rightleftharpoons$ water system, which of the following will happen ?

(1) More ice is formed
(2) Water will evaporate
(3) The system will not be in equilibrium
(4) More water is formed

50. The partition coefficient of iodine between carbon tetrachloride and water is 90. The volume of carbon tetrachloride required for 95% of the iodine to be extracted from 100 ml of aqueous solution will be equal to :

(1) 21.1 ml (2) 60.5 ml (3) 95.0 ml (4) 90.0 ml

51. Which of the following is false regarding galvanic cells ?

(1) It converts chemical energy into electrical energy
(2) The electrolytes taken in the two beakers are different
(3) The reactions taking place are non-spontaneous
(4) To set up this cell, a salt bridge is used

52. The standard oxidation potential of Ni/Ni^{2+} electrode is $0.3V$. If this is combined with a hydrogen electrode in acid solution, at what pH of the solution will the measured e.m.f. be zero at 25°C ? (Assume $[Ni^{2+}] = 1M$)

(1) 5.08 (2) 4.05 (3) 4.55 (4) 5.25

53. Which electrode is used for pH measurement ?

(1) Silver electrode (2) Glass electrode

(3) Redox electrode (4) Calomel electrode

54. If the observed value of the dipole moment and the bond length of HCl are 1.02 D and 0.125 nm respectively, the percentage of ionic character in the molecule will be equal to :

(1) 100 (2) 13 (3) 81 (4) 17

55. The zero point energy of a particle confined to one dimensional box of length L is :

(1) 0 (2) $h^2/8mL^2$ (3) $8h^2/mL^2$ (4) $h^2/8m$

56. The difference in energy levels of n = 2 & n = 1 of a particle in a one dimensional box is 12 units of energy, what is the difference in energy levels of $n = 3$ & $n = 2$ for the above system in the same units ?

(1) 8 (2) 5 (3) 20 (4) 10

57. The rotational constant B for the HCl molecule is 10.6 cm^{-1}. The frequency for the pure rotation transition $J = 0 \rightarrow J = 1$ is equal to :

(1) 10.6 cm^{-1} (2) 21.2 cm^{-1}

(3) 42.4 cm^{-1} (4) No absorption

58. The fundamental vibration frequency of N_2 is 2334 cm^{-1}. The force constant for the molecule will be :

(1) 2250 Nm^{-1} (2) 2334 Nm^{-1}

(3) 0.0004 Nm^{-1} (4) 83.36 Nm^{-1}

59. For a particular vibrational mode to appear in Raman spectrum, what must change ?

(1) Frequency of radiation

(2) Molecule's polarizability

(3) Intensity of radiation

(4) None of the above

60. Absorption of radiation in the UV range attributable to $n \rightarrow \pi^*$ electronic transitions is characteristic of which of the following types of compounds ?

(1) Aromatic hydrocarbons

(2) Unsaturated carbonyl compounds

(3) Non-conjugated polyenes

(4) Conjugated polyenes

61. A Spin inversion of electrons takes place in which of the following ?

(1) Internal conversion (2) Fluorescence

(3) Phosphorescence (4) None of the above

62. If 1.5 grams of a non-volatile solute ($M_w = 100$) is added to 200 ml of pure CS_2 (ρ = 1.3 g/cc) whose vapor pressure is 400 mm of Hg at 27.0°C, what is the resulting vapor pressure of the dilute solution ?

(1) 382.15 mm Hg (2) 396.60 mm Hg

(3) 401.75 mm Hg (4) 398.25 mm Hg

63. At 27°C the osmotic pressure of a 0.01 M solution of a compound is 0.492 atm. The Van't Hoff factor will be equal to :

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

64. Boiling point of chloroform is 61°C. After addition of 5.0 g of a non-volatile solute to 20 g chloroform the solution boils at 64.63°C. If $K_b = 3.63$ K kg mol^{-1}, what is the molecular weight of the solute ?

(1) 320 (2) 100 (3) 250 (4) 400

65. In which of the following equilibrium either P or T can be changed independently ?

(1) Invariant (2) Univariant (3) Divariant (4) All of the above

66. Which is a metastable equilibrium in sulphur system ?

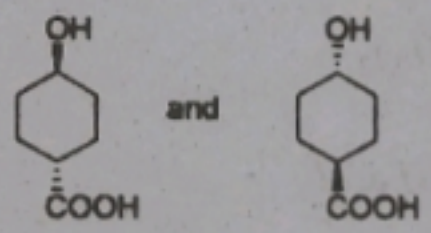
(1) $S_r \rightleftarrows S_m \rightleftarrows S_v$ (2) $S_m \rightleftarrows S_l \rightleftarrows S_v$

(3) $S_m \rightleftarrows S_r \rightleftarrows S_l$ (4) $S_r \rightleftarrows S_l \rightleftarrows S_v$

67. Number of hyperconjugation structures in isopropyl radical is :

(1) 3 (2) 6 (3) 9 (4) 12

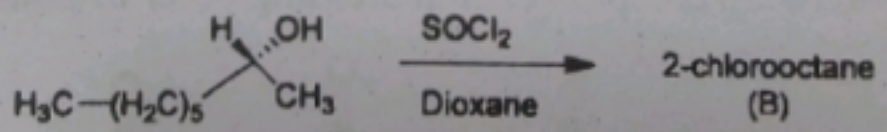
68. The given compounds are :



(1) Diastereomers (2) Enantiomers

(3) Identical (4) Regioisomers

69. The statement that is true about the reaction given below is :



(A)

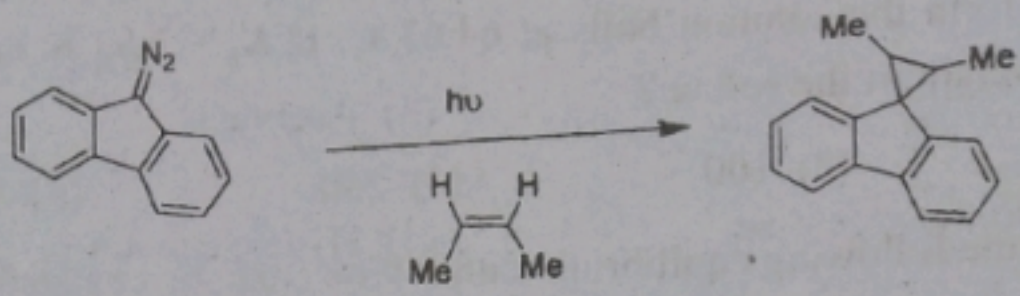
(1) (A) and (B) both are R-isomers

(2) (A) and (B) both are S-isomers

(3) (A) is R-isomer and (B) is S-isomer

(4) (A) is S-isomer and (B) is R-isomer

70. Which intermediate is involved in the following reaction ?



(1) Free radical

(2) Carbocation

(3) Carbanion

(4) Carbene

71. Identify the compound with highest ring strain ?

(1) Cyclohexane

(2) Cyclopropane

(3) Cyclobutane

(4) Cyclopentane

72. Which alkene on ozonolysis gives CH_3CH_2CHO and CH_3COCH_3 ?

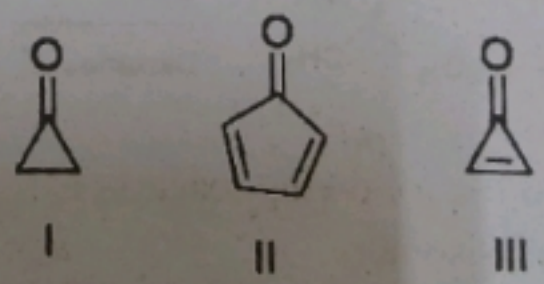
(1) $CH_3CH_2CH = C(CH_3)_2$

(2) $CH_3CH_2CH = CHCH_2CH_3$

(3) $CH_3CH_2CH = CHCH_3$

(4) $(CH_3)_2C = CHCH_3$

73. Arrange the following compounds in increasing order of polarity :



I II III

(1) I < II < III

(2) III < II < I

(3) II < I < III

(4) III < I < II

74. Majority of the alkynes are ***not*** prepared from/ by :

(1) Condensation

(2) Acetylene

(3) Dehydrohalogenation

(4) Hydrogenation

75. In $S_N{}^2$ reaction of *cis*-3-methylcyclopentyl bromide with aqueous alkali, the product formed is :

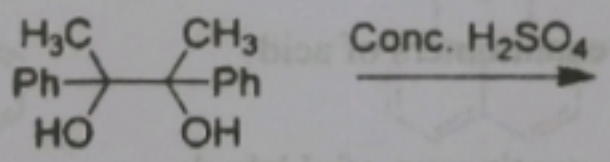
(1) a *cis*-alcohol

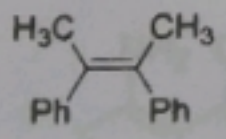
(2) a *trans*-alcohol

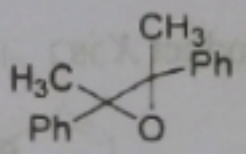
(3) an equimolecular mixture of *cis* and *trans*-alcohols

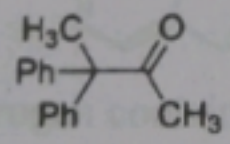
(4) there is no reaction

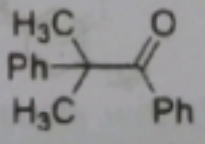
76. Product A in this reaction is :



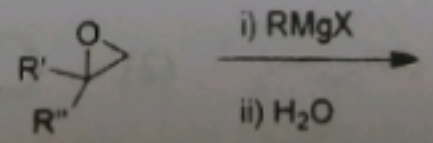
(1) 

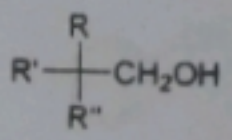
(2) 

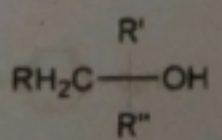
(3) 

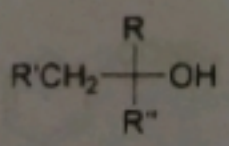
(4) 

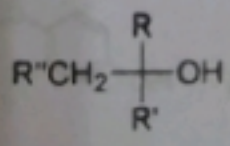
77. The product obtained in the following reaction is :



(1) 

(2) 

(3) 

(4) 

78. Which reagent can distinguish ethanol and phenol ?

(1) $SOCl_2$

(2) CH_3COCl

(3) $(CH_3CO)_2O$

(4) CH_3COOH

79. $CH_3CHO + HCN \rightarrow \xrightarrow{H_3O^+}$

The product is a :

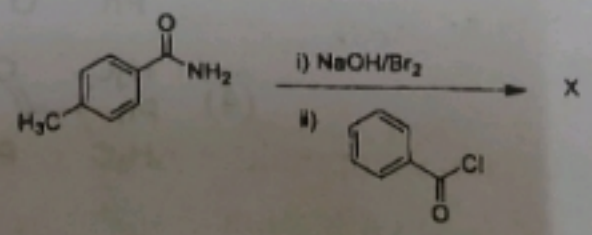
(1) Mixture of 1 : 1 enantiomers of acid

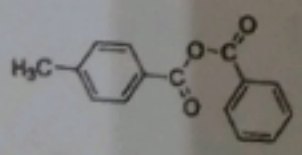
(2) Mixture of 1 : 1 diastereomers of acid

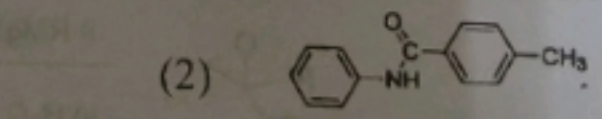
(3) Mixture of 1 : 2 enantiomers of acid

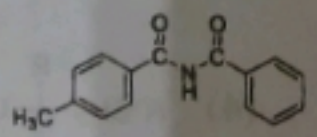
(4) Mixture of 1 : 1 enantiomers of aldehyde

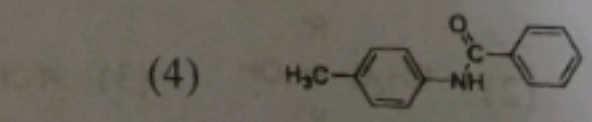
80. The structure of the product X is :



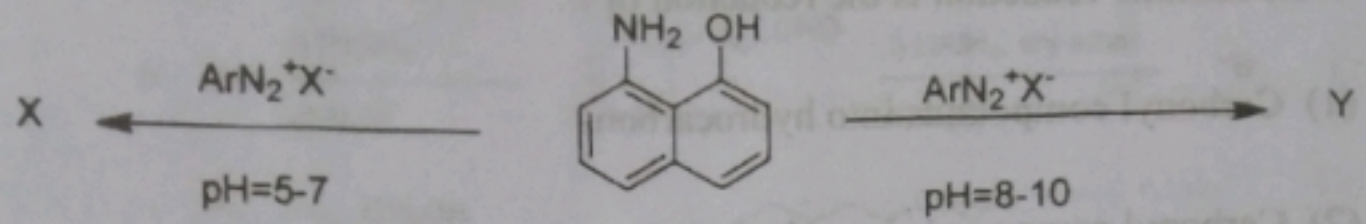
(1) 

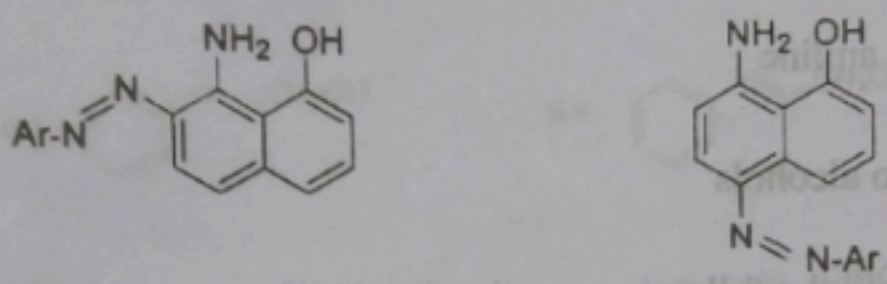
(2) 

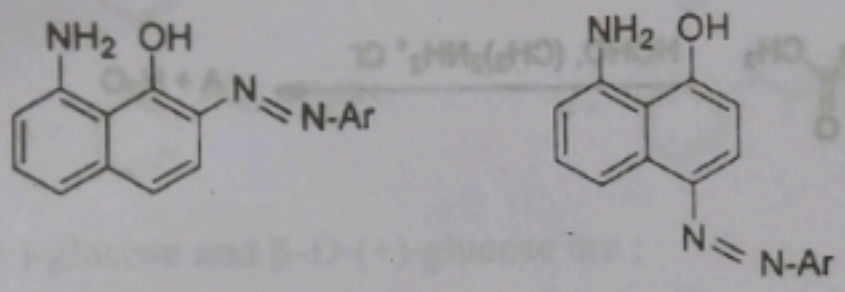
(3) 

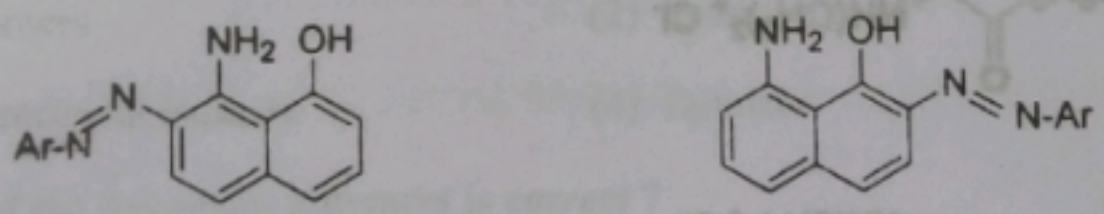
(4) 

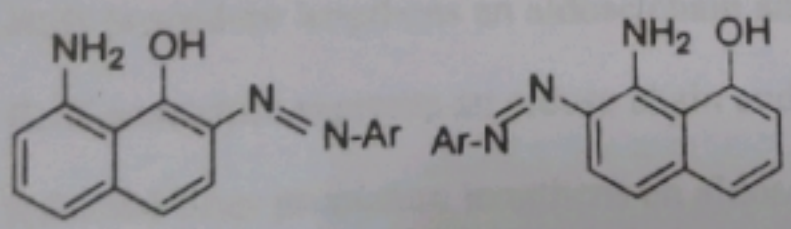
81. X and Y respectively are :



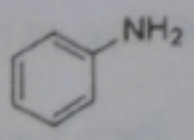
(1) 

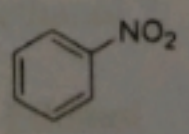
(2) 

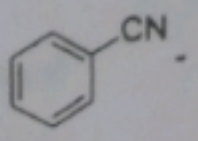
(3) 

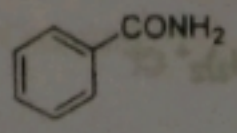
(4) 

82. A nitrogen containing aromatic compound A reacts with Sn/HCl followed by HNO_2 to give an unstable compound B. B on treatment with phenol forms a coloured compound C with molecular formula $C_{12}H_{10}N_2O$. The structure of compound A is :

(1) 

(2) 

(3) 

(4) 

83. Wolf-Kishner reduction is the reduction of :

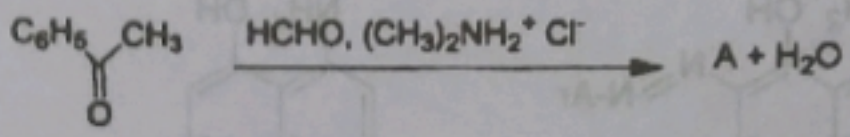
(1) Carbonyl compounds into hydrocarbons

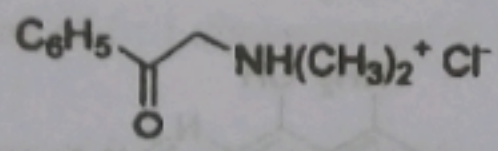
(2) Carbonyl compounds into alcohols

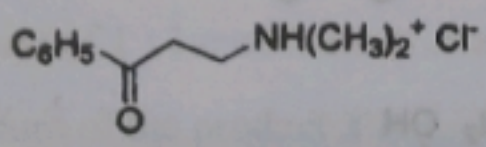
(3) Nitrobenzene into aniline

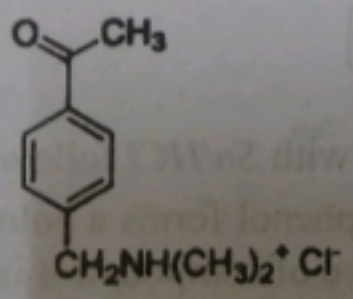
(4) Carbohydrates into alcohols

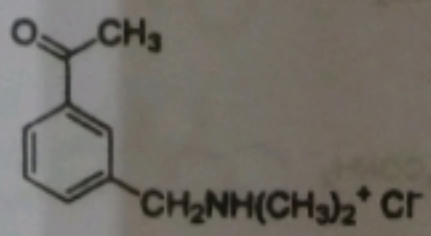
84. The product A formed in the following reaction is :



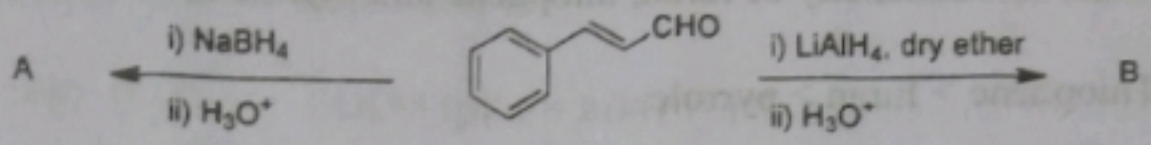
(1) 

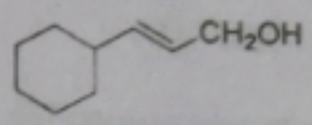
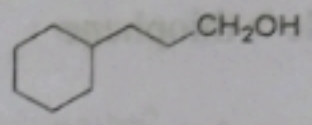
(2) 

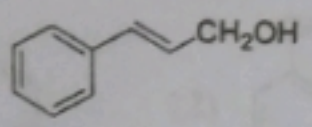
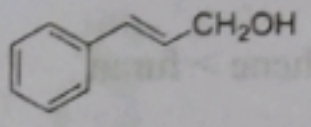
(3) 

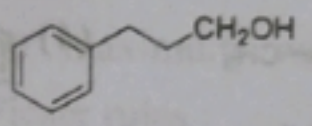
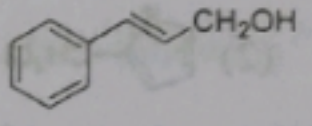
(4) 

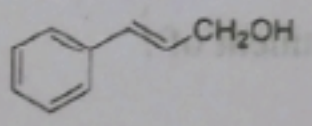
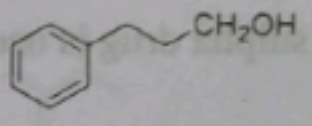
85. The major products A and B respectively for the following reaction are :



(1) A =  B = 

(2) A =  B = 

(3) A =  B = 

(4) A =  B = 

86. α–D–(+)-glucose and β-D-(+)-glucose are :

(1) Anomers
(2) Enantiomers
(3) Geometrical isomers
(4) Epimers

87. Which of the following statement is ***correct*** ?

(1) The Ruff procedure lengthens an aldose chain and gives a single product.

(2) The Ruff procedure shortens an aldose chain and gives two epimers.

(3) The Kiliani-Fisher procedure lengthens an aldose chain and gives two epimers.

(4) The Kiliani-Fisher procedure shortens an aldose chain and gives a single product.

88. Which of the following reagents, when treated with phenyl magnesium bromide followed by acid workup, will yield 2-phenylethanol ?

(1) Diethyl ether
(2) Ethanol
(3) Ethanal
(4) Oxirane

89. The order of aromaticity of furan, thiophene and pyrrole is :

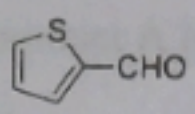
(1) Thiophene > furan > pyrrole

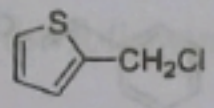
(2) Furan > pyrrole > thiophene

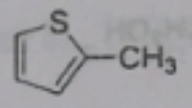
(3) Thiophene > pyrrole > furan

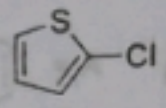
(4) Pyrrole > thiophene > furan

90. Thiophene reacts with HCHO in the presence of aq. HCl to give :

(1) 

(2) 

(3) 

(4) 

91. Sulphaguanidine, a sulpha drug is used for the treatment of :

(1) Eye diseases

(2) Bacillary dysentery

(3) Pneumonia

(4) Skin infections

92. Which of the following is a product formed in Claisen Condensation ?

(1) β-ester

(2) β-ketone

(3) β- keto ester

(4) γ-diketone

93. Bakelite is a condensation polymer of phenol and formaldehyde. The initial step between two compounds is an example of :

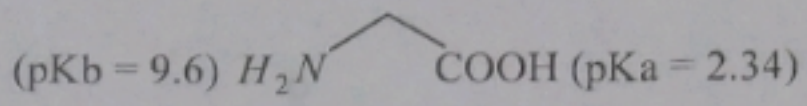
(1) Free radical reaction

(2) Aldol condensation

(3) Aromatic nucleophilic substitution

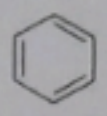
(4) Aromatic electrophilic substitution

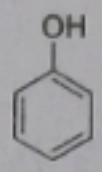
94. The isoelectric point of the amino acid is :

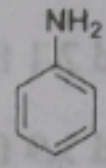


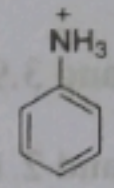
(1) 3.35 (2) 10.64 (3) 5.97 (4) 8.02

95. Which of the following absorbs at more wavelength ?

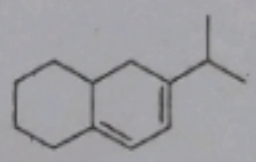
(1) 

(2) 

(3) 

(4) 

96. Calculate the maximum wavelength of the following compound according to Woodward Fieser rules :



(1) 278 nm (2) 273 nm (3) 283 nm (4) 290 nm

97. What is the relation between restoring force, f to the displacement, q in the Hooke's law ?

(1) $f = -kq$ (2) $f = kq$ (3) $f = kq^2$ (4) $f = -kq^2$

98. What is the order of decreasing vibrational frequency for C–Cl, C–Br, C–C, C–O and C–H ?

(1) C–Cl, C–Br, C–C, C–H, C–O

(2) C–O, C–H, C–Br, C–Cl, C–C

(3) C–Br, C–Cl, C–O, C–C, C–H

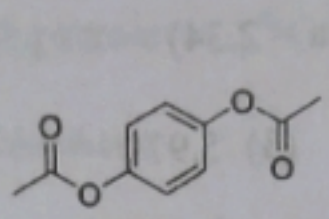
(4) C–H, C–C, C–O, C–Cl, C–Br

99. How many methyl peaks would you expect to observe in the ^{1}H NMR spectrum of *cis*-1,4- dimethylcyclohexane ?

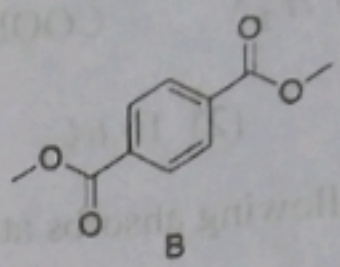
(1) 2 (2) 3 (3) 1 (4) 4

20

100. Compounds A and B exhibit two singlets, each in their ^1H NMR spectra. The expected chemical shifts are at δ :



A



B

(1) 6.9 and 3.9 for A; 7.7 and 2.1 for B

(2) 7.7 and 2.1 for A; 6.9 and 3.9 for B

(3) 7.7 and 3.9 for A; 6.9 and 2.1 for B

(4) 6.9 and 2.1 for A; 7.7 and 3.9 for B

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

B

SET-Y

PG-EE-2022

SUBJECT : Chemistry

11474

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

SEAL

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. Identify the compound with highest ring strain ?

(1) Cyclohexane (2) Cyclopropane

(3) Cyclobutane (4) Cyclopentane

2. Which alkene on ozonolysis gives CH_3CH_2CHO and CH_3COCH_3 ?

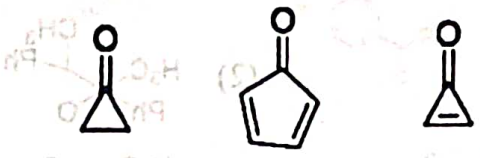
(1) $CH_3CH_2CH = C(CH_3)_2$

(2) $CH_3CH_2CH = CHCH_2CH_3$

(3) $CH_3CH_2CH = CHCH_3$

(4) $(CH_3)_2C = CHCH_3$

3. Arrange the following compounds in increasing order of polarity :



I II III

(1) I < II < III (2) III < II < I

(3) II < I < III (4) III < I < II

4. Majority of the alkynes are ***not*** prepared from/ by :

(1) Condensation

(2) Acetylene

(3) Dehydrohalogenation

(4) Hydrogenation

5. In $S_N{}^2$ reaction of *cis*-3-methylcyclopentyl bromide with aqueous alkali, the product formed is :

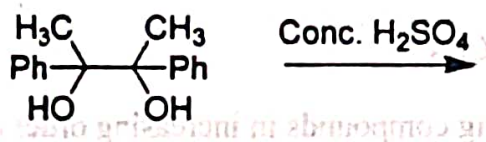
(1) a *cis*-alcohol

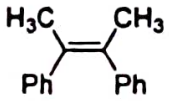
(2) a *trans*-alcohol

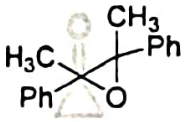
(3) an equimolecular mixture of *cis* and *trans*-alcohols

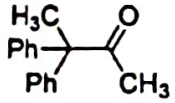
(4) there is no reaction

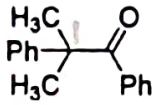
6. Product A in this reaction is :



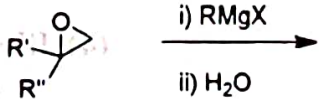
(1) 

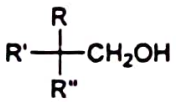
(2) 

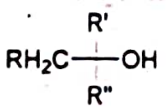
(3) 

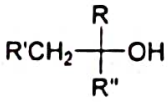
(4) 

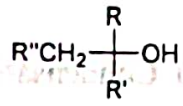
7. The product obtained in the following reaction is :



(1) 

(2) 

(3) 

(4) 

8. Which reagent can distinguish ethanol and phenol ?

(1) $SOCl_2$

(2) CH_3COCl

(3) $(CH_3CO)_2O$

(4) CH_3COOH

9. $CH_3CHO + HCN \rightarrow \xrightarrow{H_3O^+}$

The product is a :

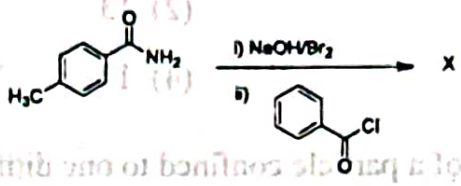
(1) Mixture of 1 : 1 enantiomers of acid

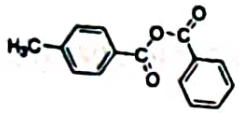
(2) Mixture of 1 : 1 diastereomers of acid

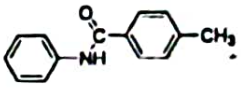
(3) Mixture of 1 : 2 enantiomers of acid

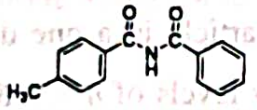
(4) Mixture of 1 : 1 enantiomers of aldehyde

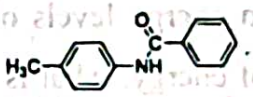
10. The structure of the product *X* is :



(1) 

(2) 

(3) 

(4) 

11. Which of the following is false regarding galvanic cells ?

(1) It converts chemical energy into electrical energy

(2) The electrolytes taken in the two beakers are different

(3) The reactions taking place are non-spontaneous

(4) To set up this cell, a salt bridge is used

12. The standard oxidation potential of Ni/Ni^{2+} electrode is $0.3V$. If this is combined with a hydrogen electrode in acid solution, at what pH of the solution will the measured e.m.f. be zero at 25°C ? (Assume $[Ni^{2+}] = 1M$)

(1) 5.08 (2) 4.05 (3) 4.55 (4) 5.25

13. Which electrode is used for pH measurement ?

(1) Silver electrode (2) Glass electrode

(3) Redox electrode (4) Calomel electrode

14. If the observed value of the dipole moment and the bond length of *HCl* are 1.02 D and 0.125 nm respectively, the percentage of ionic character in the molecule will be equal to :

(1) 100 (2) 13

(3) 81 (4) 17

15. The zero point energy of a particle confined to one dimensional box of length L is :

(1) 0 (2) $h^2/8mL^2$

(3) $8h^2/mL^2$ (4) $h^2/8m$

16. The difference in energy levels of n = 2 & n = 1 of a particle in a one dimensional box is 12 units of energy, what is the difference in energy levels of $n = 3$ & $n = 2$ for the above system in the same units ?

(1) 8 (2) 5

(3) 20 (4) 10

17. The rotational constant B for the *HCl* molecule is 10.6 cm^{-1}. The frequency for the pure rotation transition $J = 0 \rightarrow J = 1$ is equal to :

(1) 10.6 cm^{-1} (2) 21.2 cm^{-1}

(3) 42.4 cm^{-1} (4) No absorption

18. The fundamental vibration frequency of N_2 is 2334 cm^{-1}. The force constant for the molecule will be :

(1) 2250 Nm^{-1}

(2) 2334 Nm^{-1}

(3) 0.0004 Nm^{-1}

(4) 83.36 Nm^{-1}

19. For a particular vibrational mode to appear in Raman spectrum, what must change ?

(1) Frequency of radiation

(2) Molecule's polarizability

(3) Intensity of radiation

(4) None of the above

20. Absorption of radiation in the UV range attributable to $n \rightarrow \pi^*$ electronic transitions is characteristic of which of the following types of compounds ?

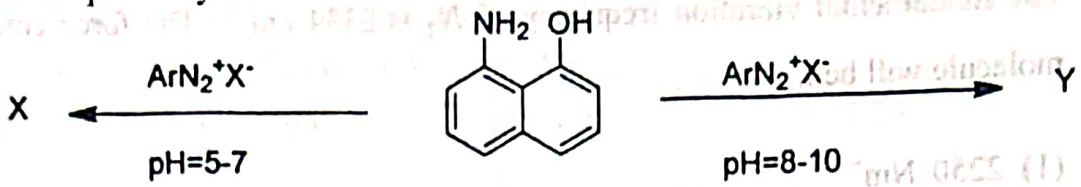
(1) Aromatic hydrocarbons

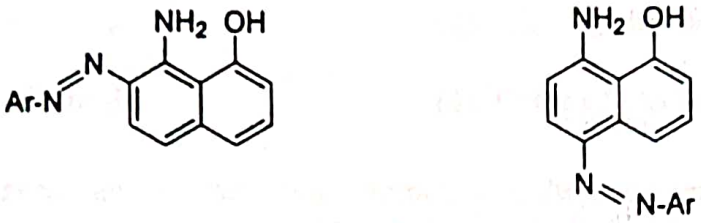
(2) Unsaturated carbonyl compounds

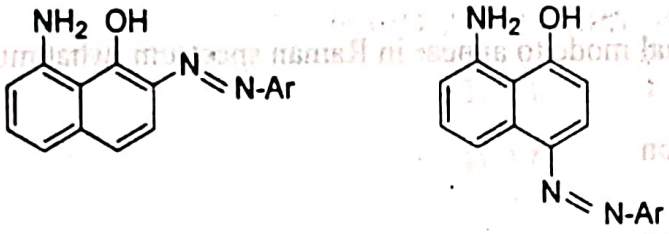
(3) Non-conjugated polyenes

(4) Conjugated polyenes

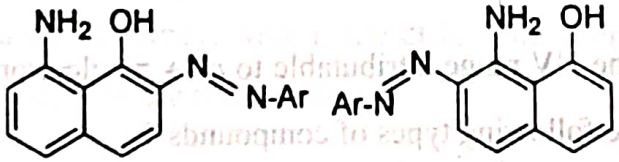
21. X and Y respectively are :



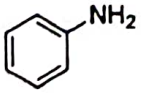
(1) 

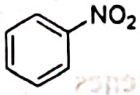
(2) 

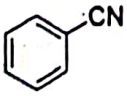
(3) 

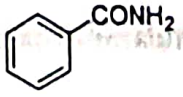
(4) 

22. A nitrogen containing aromatic compound A reacts with *Sn/HCl* followed by HNO_2 to give an unstable compound *B*. *B* on treatment with phenol forms a coloured compound *C* with molecular formula $C_{12}H_{10}N_2O$. The structure of compound *A* is :

(1) 

(2) 

(3) 

(4) 

23. Wolf-Kishner reduction is the reduction of :

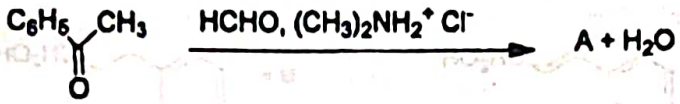
(1) Carbonyl compounds into hydrocarbons

(2) Carbonyl compounds into alcohols

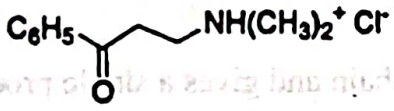
(3) Nitrobenzene into aniline

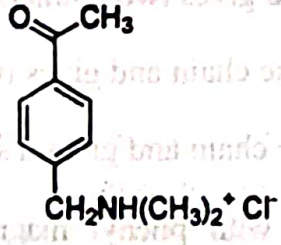
(4) Carbohydrates into alcohols

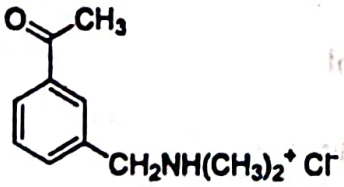
24. The product A formed in the following reaction is :



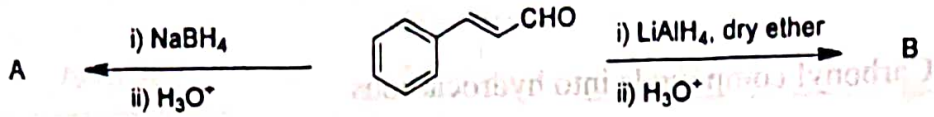
(1) 

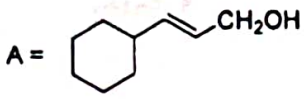
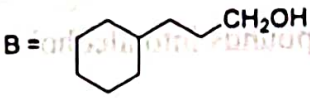
(2) 

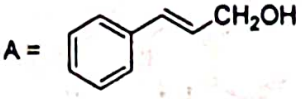
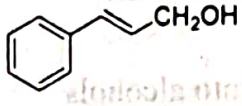
(3) 

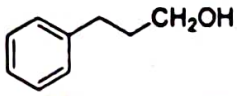
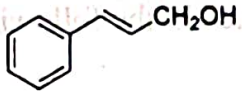
(4) 

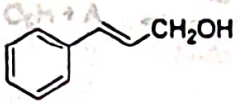
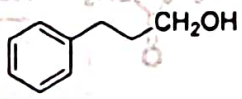
25. The major products A and B respectively for the following reaction are :



(1) A =  B = 

(2) A =  B = 

(3) A =  B = 

(4) A =  B = 

26. α–D–(+)-glucose and β-D-(+)-glucose are :

(1) Anomers (2) Enantiomers

(3) Geometrical isomers (4) Epimers

27. Which of the following statement is ***correct*** ?

(1) The Ruff procedure lengthens an aldose chain and gives a single product.

(2) The Ruff procedure shortens an aldose chain and gives two epimers.

(3) The Kiliani-Fisher procedure lengthens an aldose chain and gives two epimers.

(4) The Kiliani-Fisher procedure shortens an aldose chain and gives a single product.

28. Which of the following reagents, when treated with phenyl magnesium bromide followed by acid workup, will yield 2-phenylethanol ?

(1) Diethyl ether (2) Ethanol

(3) Ethanal (4) Oxirane

29. The order of aromaticity of furan, thiophene and pyrrole is :

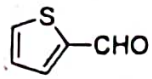
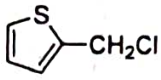
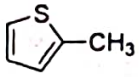
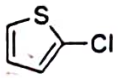
(1) Thiophene > furan > pyrrole

(2) Furan > pyrrole > thiophene

(3) Thiophene > pyrrole > furan

(4) Pyrrole > thiophene > furan

30. Thiophene reacts with HCHO in the presence of aq. HCl to give :

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

31. Identify the strongest Bronsted acid :

(1) H_2SO_4 (2) CH_3COOH

(3) HNO_3 (4) H_3PO_4

32. Which of the following does ***not*** give flame colourations ?

(1) Ca^{2+} (2) Na^{+} (3) Cu^{2+} (4) Cd^{2+}

33. The structure of XeF_2 and XeO_2F_2 respectively are :

(1) bent, tetrahedral (2) linear, square planar

(3) linear, see-saw (4) bent, see-saw

34. Among the following electronic configurations, the one corresponding to the element with the highest ionization energy is :

(1) [Ne] $3s^2 3p^1$ (2) [Ar] $3d^{10} 4s^2 4p^2$

(3) [Ne] $3s^2 3p^2$ (4) [Ne] $3s^2 3p^3$

35. The reaction in which the molecules of the solvent get attached to the solute species are called :

(1) Solvation reaction (2) Solvolytic reaction

(3) Metathetical reaction (4) Redox reaction

36. Oxymyoglobin $Mb(O)_2$ and oxyhemoglobin $Hb(O)_2$, respectively are :

(1) paramagnetic and paramagnetic

(2) diamagnetic and diamagnetic

(3) paramagnetic and diamagnetic

(4) diamagnetic and paramagnetic

37. The ring size and the number of linked tetrahedral present in $[Si_6O_{18}]^{12-}$ are, respectively :

(1) 6 and 6 (2) 12 and 6 (3) 12 and 12 (4) 6 and 12

38. The IUPAC nomenclature of $Na[PCl_6]$ is :

(1) Sodium hexachlorophosphine (V)

(2) Sodium hexachlorophosphate (V)

(3) Sodium hexachlorophosphine

(4) Sodium hexachlorophosphite (V)

39. Coordination number and geometry of $[Ce(NO_3)_6]^{2-}$ is :

(1) 6, Octahedral (2) 12, Octahedral

(3) 8, Dodecahedral (4) 12, Icosahedral

40. Which of the following has highest lattice energy ?

(1) KF (2) NaF (3) CsF (4) RbF

41. Sulphaguanidine, a sulpha drug is used for the treatment of :

(1) Eye diseases (2) Bacillary dysentery

(3) Pneumonia (4) Skin infections

42. Which of the following is a product formed in Claisen Condensation ?

(1) β-ester (2) β-ketone

(3) β- keto ester (4) γ-diketone

43. Bakelite is a condensation polymer of phenol and formaldehyde. The initial step between two compounds is an example of :

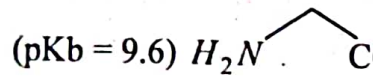
(1) Free radical reaction

(2) Aldol condensation

(3) Aromatic nucleophilic substitution

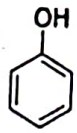
(4) Aromatic electrophilic substitution

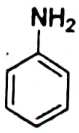
44. The isoelectric point of the amino acid is :

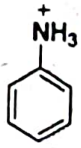


(1) 3.35 (2) 10.64 (3) 5.97 (4) 8.02

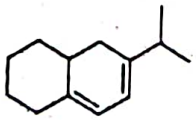
45. Which of the following absorbs at more wavelength ?

(1)  (2) 

(3) 

(4) 

46. Calculate the maximum wavelength of the following compound according to Woodward Fieser rules :



(1) 278 nm (2) 273 nm (3) 283 nm (4) 290 nm

47. What is the relation between restoring force, f to the displacement, q in the Hooke's law ?

(1) $f = -kq$ (2) $f = kq$ (3) $f = kq^2$ (4) $f = -kq^2$

48. What is the order of decreasing vibrational frequency for C–Cl, C–Br, C–C, C–O and C–H ?

(1) C–Cl, C–Br, C–C, C–H, C–O

(2) C–O, C–H, C–Br, C–Cl, C–C

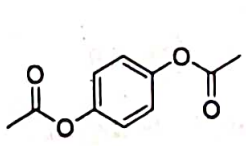
(3) C–Br, C–Cl, C–O, C–C, C–H

(4) C–H, C–C, C–O, C–Cl, C–Br

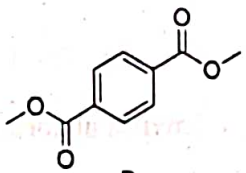
49. How many methyl peaks would you expect to observe in the ^{1}H NMR spectrum of *cis*-1,4- dimethylcyclohexane ?

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

50. Compounds A and B exhibit two singlets, each in their ^{1}H NMR spectra. The expected chemical shifts are at δ :



A



B

(1) 6.9 and 3.9 for A; 7.7 and 2.1 for B

(2) 7.7 and 2.1 for A; 6.9 and 3.9 for B

(3) 7.7 and 3.9 for A; 6.9 and 2.1 for B

(4) 6.9 and 2.1 for A; 7.7 and 3.9 for B

51. A Spin inversion of electrons takes place in which of the following ?

(1) Internal conversion (2) Fluorescence

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52. If 1.5 grams of a non-volatile solute (M_w = 100) is added to 200 ml of pure CS_2 (ρ = 1.3 g/cc) whose vapor pressure is 400 mm of Hg at 27.0°C, what is the resulting vapor pressure of the dilute solution ?

(1) 382.15 mm Hg
(2) 396.60 mm Hg
(3) 401.75 mm Hg
(4) 398.25 mm Hg

53. At 27°C the osmotic pressure of a 0.01 M solution of a compound is 0.492 atm. The Van't Hoff factor will be equal to :

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

54. Boiling point of chloroform is 61°C. After addition of 5.0 g of a non-volatile solute to 20 g chloroform the solution boils at 64.63°C. If K_b = 3.63 K kg mol^{-1}, what is the molecular weight of the solute ?

(1) 320
(2) 100
(3) 250
(4) 400

55. In which of the following equilibrium either P or T can be changed independently ?

(1) Invariant
(2) Univariant
(3) Divariant
(4) All of the above

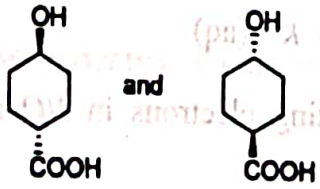
56. Which is a metastable equilibrium in sulphur system ?

(1) $S_r \rightleftarrows S_m \rightleftarrows S_v$
(2) $S_m \rightleftarrows S_l \rightleftarrows S_v$
(3) $S_m \rightleftarrows S_r \rightleftarrows S_l$
(4) $S_r \rightleftarrows S_l \rightleftarrows S_v$

57. Number of hyperconjugation structures in isopropyl radical is :

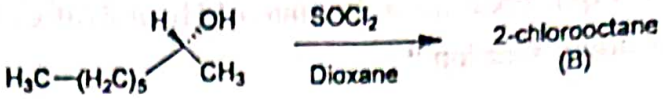
(1) 3
(2) 6
(3) 9
(4) 12

58. The given compounds are :



(1) Diastereomers
(2) Enantiomers
(3) Identical
(4) Regioisomers

59. The statement that is true about the reaction given below is :



(A)

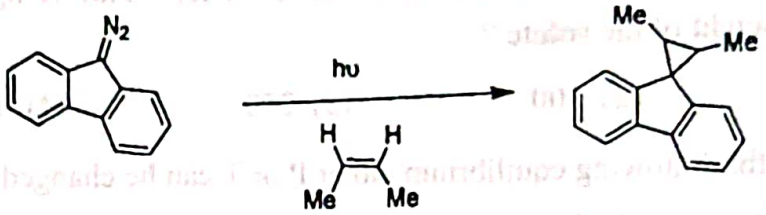
(1) (A) and (B) both are R-isomers

(2) (A) and (B) both are S-isomers

(3) (A) is R-isomer and (B) is S-isomer

(4) (A) is S-isomer and (B) is R-isomer

60. Which intermediate is involved in the following reaction ?



(1) Free radical

(2) Carbocation

(3) Carbanion

(4) Carbene

61. Which of the following are arranged in order of increasing radius ?

(1) $K^+(aq) < Na^+(aq) < Li^+(aq)$

(2) $K^+(aq) < Li^+(aq) < Na^+(aq)$

(3) $Li^+(aq) < K^+(aq) < Na^+(aq)$

(4) $Na^+(aq) < Li^+(aq) < K^+(aq)$

62. The number of antibonding electrons in *NO* and *CO* according to *MO* theory are respectively :

(1) 1, 0

(2) 2, 2

(3) 3, 2

(4) 2, 3

63. Ozone present in upper atmosphere protects people on earth :

(1) due to its diamagnetic nature

(2) due to its blue colour

(3) due to absorption of radiation of wavelength at 255 nm

(4) by destroying chlorofluoro carbons

64. The temperature at which *RMS* velocity of SO_2 molecules is half that of *He* molecules at 300 K is :

(1) 150 K (2) 600 K (3) 900 K (4) 1200 K

65. The mean free path of oxygen molecules at 0°C and one atmospheric pressure will be equal to (molecular diameter of oxygen molecule is 2.0×10^{-8} cm) :

(1) 2.1×10^{-5} cm (2) 4.2×10^{-5} cm

(3) 2.9×10^{-5} cm (4) 1.0×10^{-8} cm

66. What will be the Vander Waal's constant b for carbon dioxide in lit mol^{-1} (given that $T_C = 304$ K and $P_C = 73$ atm) ?

(1) 0.043 (2) 2.732 (3) 0.341 (4) 4.164

67. What happens to the viscosity of liquid with the increase in temperature ?

(1) It increases (2) It decreases

(3) It may increase or decrease (4) No change

68. Which of the following statements is ***not*** true about smectic liquid crystals ?

(1) They have limited mobility

(2) They do not flow as normal liquids

(3) The concept of viscosity is applicable to them

(4) They show X-ray diffraction patterns

69. Rate constant of a reaction can be expressed by Arrhenius equation as : $k = Ae^{\frac{-Ea}{RT}}$. In this equation, E_a, represents :

(1) The energy above which all the colliding molecules will react

(2) The energy below which the colliding molecules will not react

(3) The total energy of the reacting molecules at a temperature T

(4) The fraction of molecules with energy greater than the activation energy

70. Which of the following statements is true in the Transition State Theory (TST) ?

(1) TST fails for some reactions at high temperature

(2) Activated complex is in quasi-equilibrium with the reactants

(3) TST is not applicable when the intermediates are very short-lived

(4) All of the above

71. Ostwald dilution law is applicable to :

(1) Strong electrolytes only (2) Weak electrolytes only

(3) non electrolytes (4) Strong as well as weak electrolytes

72. Which of the following is ***not*** a type of acidic buffer solution ?

(1) $Na_2HPO_4 + Na_3PO_4$ (2) $CH_3COOH + CH_3COONa$

(3) $H_2CO_3 + Na_2CO_3$ (4) $H_3PO_4 + NaH_2PO_4$

73. When a large ion is replaced by a small ion, the conductivity of the solution :

(1) Decreases (2) Increases

(3) Remains unchanged (4) None of the above

74. All of the following are intensive properties except :

(1) Mass (2) Viscosity

(3) Density (4) Temperature

75. In an isothermal process change in internal energy :

(1) Decreases
(2) Increases
(3) Remains constant
(4) Becomes zero

76. The ratio of the rise in temperature of a gas when compressed adiabatically to that when compressed isothermally to the same extent is :

(1) Less than 1
(2) More than 1
(3) Equal to 1
(4) Depends on the gas

77. Three Carnot engines A, B and C have source temperatures 750 K, 700 K & 650 K and sink temperatures 400 K, 350 K & 300 K respectively. Which engine is the least efficient ?

(1) Engine A
(2) Engine B
(3) Engine C
(4) All have the same efficiencies

78. For the reaction; $SBr_4(g) \rightarrow S(g) + 2Br_2(l)$; $\Delta H^\circ = +115$ kJ and $\Delta S^\circ = +125$ J/K at 25°C. ΔG° for the reaction at 25°C will be :

(1) +152.00kJ (2) −56.75 kJ (3) +77.75 kJ (4) +37.10 kJ

79. When pressure is applied to ice $\rightleftharpoons$ water system, which of the following will happen ?

(1) More ice is formed
(2) Water will evaporate
(3) The system will not be in equilibrium
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80. The partition coefficient of iodine between carbon tetrachloride and water is 90. The volume of carbon tetrachloride required for 95% of the iodine to be extracted from 100 ml of aqueous solution will be equal to :

(1) 21.1 ml (2) 60.5 ml (3) 95.0 ml (4) 90.0 ml

81. Among the following, metal carbonyl species having highest υ_{CO} stretching frequency is :

(1) $[Mn(CO)_6]^+$ (2) $[Cr(CO)_6]$

(3) $[V(CO)_6]^-$ (4) $[Fe(CO)_4]^{2-}$

82. Glauber's salt is :

(1) $MgSO_4.7H_2O$ (2) $Na_2SO_4.10H_2O$

(3) $CuSO_4.5H_2O$ (4) $FeSO_4.7H_2O$

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(1) Black (2) Yellow

(3) Blue (4) White

84. A 3p atomic orbital has :

(1) one radial node and one angular node

(2) two angular nodes

(3) one angular node

(4) one radial node

85. The geometry around the central atom in the ClF_4^+ is :

(1) square planar (2) square pyramidal

(3) octahedral (4) trigonal bipyramidal

86. Which of the following ions is not expected to be coloured ?

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

(3) Ti^{3+} (4) Cu^+

87. The S and L values for ^{15}N atom respectively, are :

(1) 1/2 and 1 (2) 1/2 and 0

(3) 1 and 0 (4) 3/2 and 0

88. Chelate effect is :

(1) Predominantly due to enthalpy change

(2) Predominantly due to entropy change

(3) Independent of ring size

(4) Due to equal contribution of entropy and enthalpy change

89. The red colour of oxyhaemoglobin is mainly due to the :

(1) d-d transition

(2) Metal to ligand charge transfer transition

(3) Intraligand π–π^* transition

(4) Ligand to metal charge transfer transition

90. Which of the following does not obey 18 e^- rule ?

(1) $[Cr(CO)_6]$ (2) $[Fe(CO)_5]$ (3) $[V(CO)_6]$ (4) $[Mn_2(CO)_{10}]$

91. The strength of pπ-dπ bonding in A–O (A = Si, P, S, C) follows the order :

(1) Si – O > P – O > S – O > Cl – O

(2) P – O > Si – O > S – O > Cl – O

(3) S – O > Cl – O > P – O > Si – O

(4) Cl – O > S – O > P – O > Si – O

92. The order of acidity in boron trihalides is :

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BBr_3 > BCl_3 > BF_3$

(3) $BF_3 > BBr_3 > BCl_3$ (4) $BBr_3 > BF_3 > BCl_3$

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(1) I (2) III (3) V (4) –I

94. Xenon forms several fluorides and oxofluorides which exhibit acidic behavior. The correct sequence of descending Lewis acidity among the given species is represented by :

(1) $XeF_6 > XeOF_4 > XeF_4 > XeO_2F_2$

(2) $XeOF_4 > XeO_2F_2 > XeF_4 > XeF_6$

(3) $XeF_4 > XeO_2F_2 > XeOF_4 > XeF_6$

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(1) 3.87 BM (2) 2.84 BM (3) 6.87 BM (4) 5.20 BM

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(1) 4 (2) 3 (3) 6 (4) 5

97. The tripositive lanthanides ion which does not show sharp peak in its absorption spectrum :

(1) Ce^{3+} (2) Pr^{3+} (3) Gd^{3+} (4) Pm^{3+}

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(1) i > ii > iii > iv (2) ii > i > iii > iv

(3) iii > ii > i > iv (4) iii > i > ii > iv

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(1) $NH_3 < NF_3 < BF_3$ (2) $BF_3 < NF_3 < NH_3$

(3) $BF_3 < NH_3 < NF_3$ (4) $NF_3 < BF_3 < NH_3$

100. Silicates with continuous 3D framework are :

(1) Neso-Silicates (2) Soro-Silicates

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Total No. of Printed Pages : 21

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C

SET-Y

PG-EE-2022

SUBJECT : Chemistry

11471

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

SEAL

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1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

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(1) Neso-Silicates (2) Soro-Silicates

(3) Phyllo-Silicates (4) Tecto-Silicates

31. Sulphaguanidine, a sulpha drug is used for the treatment of :

(1) Eye diseases (2) Bacillary dysentery

(3) Pneumonia (4) Skin infections

32. Which of the following is a product formed in Claisen Condensation ?

(1) β-ester (2) β-ketone

(3) β- keto ester (4) γ-diketone

33. Bakelite is a condensation polymer of phenol and formaldehyde. The initial step between two compounds is an example of :

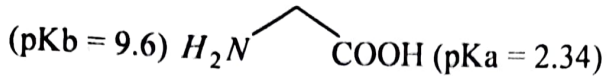
(1) Free radical reaction

(2) Aldol condensation

(3) Aromatic nucleophilic substitution

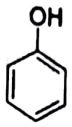
(4) Aromatic electrophilic substitution

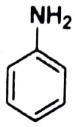
34. The isoelectric point of the amino acid is :

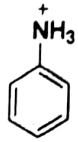


(1) 3.35 (2) 10.64 (3) 5.97 (4) 8.02

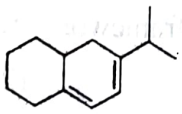
35. Which of the following absorbs at more wavelength ?

(1)  (2) 

(3) 

(4) 

36. Calculate the maximum wavelength of the following compound according to Woodward Fieser rules :



(1) 278 nm (2) 273 nm (3) 283 nm (4) 290 nm

37. What is the relation between restoring force, f to the displacement, q in the Hooke's law ?

(1) $f = -kq$ (2) $f = kq$ (3) $f = kq^2$ (4) $f = -kq^2$

38. What is the order of decreasing vibrational frequency for C–Cl, C–Br, C–C, C–O and C–H ?

(1) C–Cl, C–Br, C–C, C–H, C–O

(2) C–O, C–H, C–Br, C–Cl, C–C

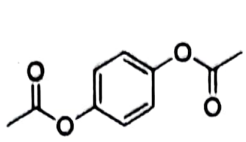
(3) C–Br, C–Cl, C–O, C–C, C–H

(4) C–H, C–C, C–O, C–Cl, C–Br

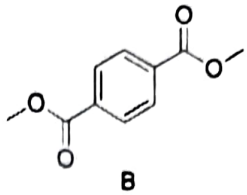
39. How many methyl peaks would you expect to observe in the ^{1}H NMR spectrum of *cis*-1,4- dimethylcyclohexane ?

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

40. Compounds A and B exhibit two singlets, each in their ^1H NMR spectra. The expected chemical shifts are at δ :



A



B

(1) 6.9 and 3.9 for A; 7.7 and 2.1 for B

(2) 7.7 and 2.1 for A; 6.9 and 3.9 for B

(3) 7.7 and 3.9 for A; 6.9 and 2.1 for B

(4) 6.9 and 2.1 for A; 7.7 and 3.9 for B

41. A Spin inversion of electrons takes place in which of the following ?

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(3) Phosphorescence (4) None of the above

42. If 1.5 grams of a non-volatile solute (M_w = 100) is added to 200 ml of pure CS_2 (ρ = 1.3 g/cc) whose vapor pressure is 400 mm of Hg at 27.0°C, what is the resulting vapor pressure of the dilute solution ?

(1) 382.15 mm Hg (2) 396.60 mm Hg

(3) 401.75 mm Hg (4) 398.25 mm Hg

43. At 27°C the osmotic pressure of a 0.01 M solution of a compound is 0.492 atm. The Van't Hoff factor will be equal to :

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

44. Boiling point of chloroform is 61°C. After addition of 5.0 g of a non-volatile solute to 20 g chloroform the solution boils at 64.63°C. If K_b = 3.63 K kg mol^{-1}, what is the molecular weight of the solute ?

(1) 320 (2) 100 (3) 250 (4) 400

45. In which of the following equilibrium either P or T can be changed independently ?

(1) Invariant

(2) Univariant

(3) Divariant

(4) All of the above

46. Which is a metastable equilibrium in sulphur system ?

(1) $S_r \rightleftarrows S_m \rightleftarrows S_v$

(2) $S_m \rightleftarrows S_l \rightleftarrows S_v$

(3) $S_m \rightleftarrows S_r \rightleftarrows S_l$

(4) $S_r \rightleftarrows S_l \rightleftarrows S_v$

47. Number of hyperconjugation structures in isopropyl radical is :

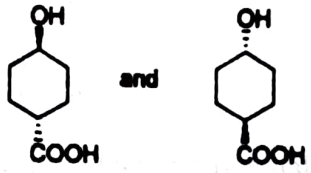
(1) 3

(2) 6

(3) 9

(4) 12

48. The given compounds are :



(1) Diastereomers

(2) Enantiomers

(3) Identical

(4) Regioisomers

49. The statement that is true about the reaction given below is :

(A)

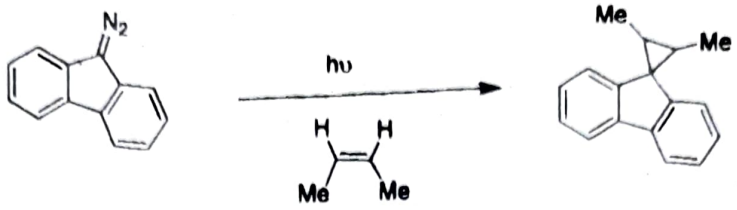
(1) (A) and (B) both are R-isomers

(2) (A) and (B) both are S-isomers

(3) (A) is R-isomer and (B) is S-isomer

(4) (A) is S-isomer and (B) is R-isomer

50. Which intermediate is involved in the following reaction ?



(1) Free radical (2) Carbocation

(3) Carbanion (4) Carbene

51. Which of the following are arranged in order of increasing radius ?

(1) $K^+(aq) < Na^+(aq) < Li^+(aq)$

(2) $K^+(aq) < Li^+(aq) < Na^+(aq)$

(3) $Li^+(aq) < K^+(aq) < Na^+(aq)$

(4) $Na^+(aq) < Li^+(aq) < K^+(aq)$

52. The number of antibonding electrons in *NO* and *CO* according to *MO* theory are respectively :

(1) 1, 0 (2) 2, 2

(3) 3, 2 (4) 2, 3

53. Ozone present in upper atmosphere protects people on earth :

(1) due to its diamagnetic nature

(2) due to its blue colour

(3) due to absorption of radiation of wavelength at 255 nm

(4) by destroying chlorofluoro carbons

54. The temperature at which *RMS* velocity of SO_2 molecules is half that of *He* molecules at 300 K is :

(1) 150 K (2) 600 K

(3) 900 K (4) 1200 K

55. The mean free path of oxygen molecules at 0°C and one atmospheric pressure will be equal to (molecular diameter of oxygen molecule is 2.0×10^{-8} cm) :

(1) 2.1×10^{-5} cm

(2) 4.2×10^{-5} cm

(3) 2.9×10^{-5} cm

(4) 1.0×10^{-8} cm

56. What will be the Vander Waal's constant b for carbon dioxide in lit mol^{-1} (given that $T_C = 304$ K and $P_C = 73$ atm) ?

(1) 0.043 (2) 2.732 (3) 0.341 (4) 4.164

57. What happens to the viscosity of liquid with the increase in temperature ?

(1) It increases

(2) It decreases

(3) It may increase or decrease

(4) No change

58. Which of the following statements is ***not*** true about smectic liquid crystals ?

(1) They have limited mobility

(2) They do not flow as normal liquids

(3) The concept of viscosity is applicable to them

(4) They show X-ray diffraction patterns

59. Rate constant of a reaction can be expressed by Arrhenius equation as : $k = Ae^{\frac{-Ea}{RT}}$. In this equation, E_a, represents :

(1) The energy above which all the colliding molecules will react

(2) The energy below which the colliding molecules will not react

(3) The total energy of the reacting molecules at a temperature T

(4) The fraction of molecules with energy greater than the activation energy

60. Which of the following statements is true in the Transition State Theory (TST) ?

(1) TST fails for some reactions at high temperature

(2) Activated complex is in quasi-equilibrium with the reactants

(3) TST is not applicable when the intermediates are very short-lived

(4) All of the above

61. Identify the compound with highest ring strain ?

(1) Cyclohexane

(2) Cyclopropane

(3) Cyclobutane

(4) Cyclopentane

62. Which alkene on ozonolysis gives CH_3CH_2CHO and CH_3COCH_3 ?

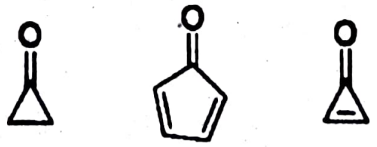
(1) $CH_3CH_2CH = C(CH_3)_2$

(2) $CH_3CH_2CH = CHCH_2CH_3$

(3) $CH_3CH_2CH = CHCH_3$

(4) $(CH_3)_2C = CHCH_3$

63. Arrange the following compounds in increasing order of polarity :



I II III

(1) I < II < III

(2) III < II < I

(3) II < I < III

(4) III < I < II

64. Majority of the alkynes are ***not*** prepared from/ by :

(1) Condensation

(2) Acetylene

(3) Dehydrohalogenation

(4) Hydrogenation

65. In $S_N{}^2$ reaction of *cis*-3-methylcyclopentyl bromide with aqueous alkali, the product formed is :

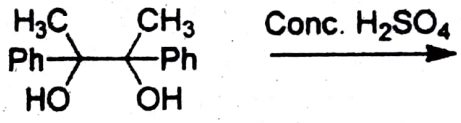
(1) a *cis*-alcohol

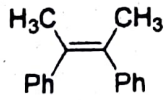
(2) a *trans*-alcohol

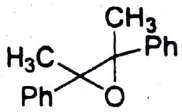
(3) an equimolecular mixture of *cis* and *trans*-alcohols

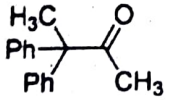
(4) there is no reaction

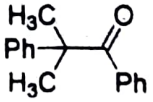
66. Product A in this reaction is :



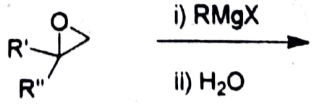
(1) 

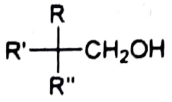
(2) 

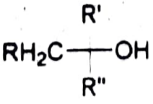
(3) 

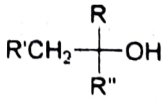
(4) 

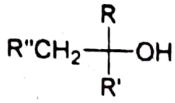
67. The product obtained in the following reaction is :



(1) 

(2) 

(3) 

(4) 

68. Which reagent can distinguish ethanol and phenol ?

(1) $SOCl_2$

(2) CH_3COCl

(3) $(CH_3CO)_2O$

(4) CH_3COOH

69. $CH_3CHO + HCN \rightarrow \xrightarrow{H_3O^+}$

The product is a :

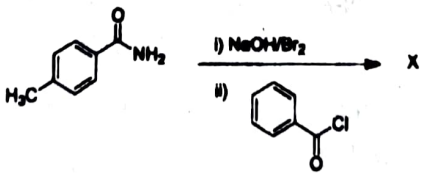
(1) Mixture of 1 : 1 enantiomers of acid

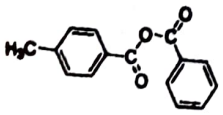
(2) Mixture of 1 : 1 diastereomers of acid

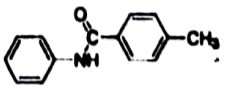
(3) Mixture of 1 : 2 enantiomers of acid

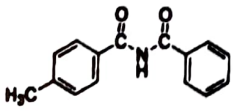
(4) Mixture of 1 : 1 enantiomers of aldehyde

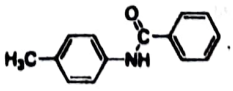
70. The structure of the product X is :



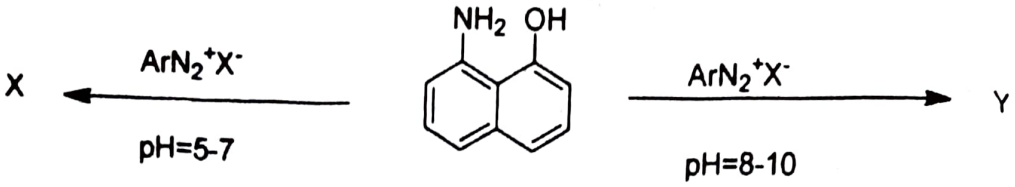
(1) 

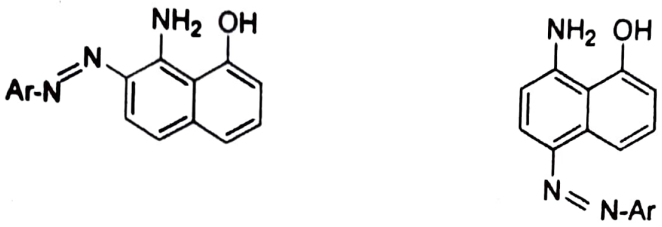
(2) 

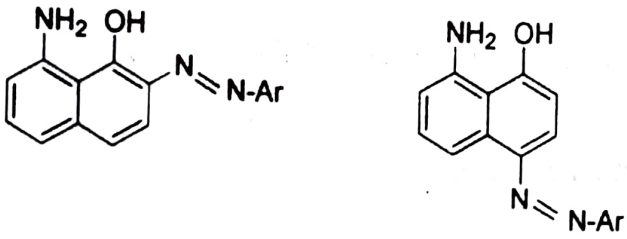
(3) 

(4) 

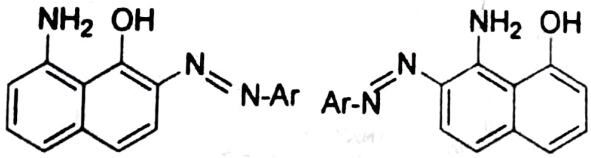
71. X and Y respectively are :



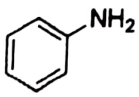
(1) 

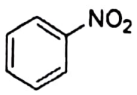
(2) 

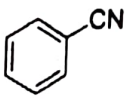
(3) 

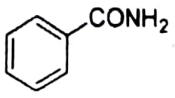
(4) 

72. A nitrogen containing aromatic compound A reacts with *Sn/HCl* followed by HNO_2 to give an unstable compound *B*. *B* on treatment with phenol forms a coloured compound *C* with molecular formula $C_{12}H_{10}N_2O$. The structure of compound *A* is :

(1) 

(2) 

(3) 

(4) 

73. Wolf-Kishner reduction is the reduction of :

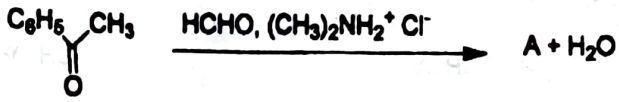
(1) Carbonyl compounds into hydrocarbons

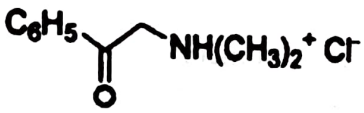
(2) Carbonyl compounds into alcohols

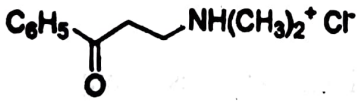
(3) Nitrobenzene into aniline

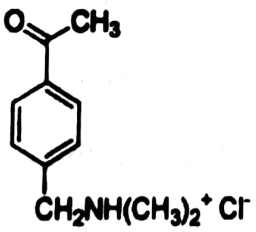
(4) Carbohydrates into alcohols

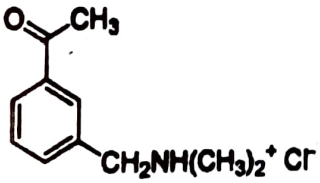
74. The product A formed in the following reaction is :



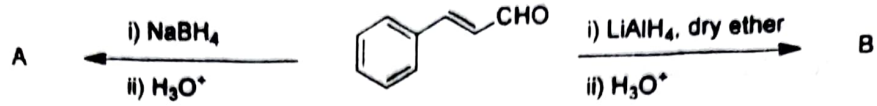
(1) 

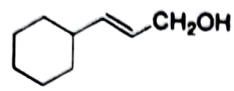
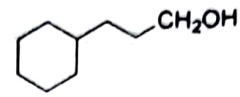
(2) 

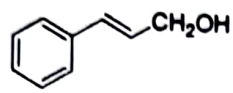
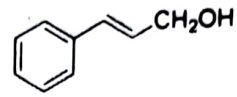
(3) 

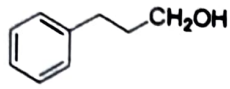
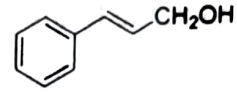
(4) 

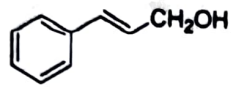
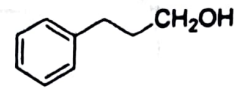
75. The major products A and B respectively for the following reaction are :



(1) A =  B = 

(2) A =  B = 

(3) A =  B = 

(4) A =  B = 

76. α–D–(+)-glucose and β-D-(+)-glucose are :

(1) Anomers (2) Enantiomers

(3) Geometrical isomers (4) Epimers

77. Which of the following statement is ***correct*** ?

(1) The Ruff procedure lengthens an aldose chain and gives a single product.

(2) The Ruff procedure shortens an aldose chain and gives two epimers.

(3) The Kiliani-Fisher procedure lengthens an aldose chain and gives two epimers.

(4) The Kiliani-Fisher procedure shortens an aldose chain and gives a single product.

78. Which of the following reagents, when treated with phenyl magnesium bromide followed by acid workup, will yield 2-phenylethanol ?

(1) Diethyl ether (2) Ethanol

(3) Ethanal (4) Oxirane

79. The order of aromaticity of furan, thiophene and pyrrole is :

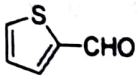
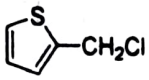
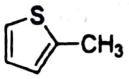
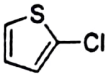
(1) Thiophene > furan > pyrrole

(2) Furan > pyrrole > thiophene

(3) Thiophene > pyrrole > furan

(4) Pyrrole > thiophene > furan

80. Thiophene reacts with HCHO in the presence of aq. HCl to give :

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

81. Identify the strongest Bronsted acid :

(1) H_2SO_4 (2) CH_3COOH (3) HNO_3 (4) H_3PO_4

82. Which of the following does ***not*** give flame colourations ?

(1) Ca^{2+} (2) Na^{+}

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83. The structure of XeF_2 and XeO_2F_2 respectively are :

(1) bent, tetrahedral (2) linear, square planar

(3) linear, see-saw (4) bent, see-saw

84. Among the following electronic configurations, the one corresponding to the element with the highest ionization energy is :

(1) [Ne] $3s^2 3p^1$ (2) [Ar] $3d^{10} 4s^2 4p^2$

(3) [Ne] $3s^2 3p^2$ (4) [Ne] $3s^2 3p^3$

85. The reaction in which the molecules of the solvent get attached to the solute species are called :

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86. Oxymyoglobin $Mb(O)_2$ and oxyhemoglobin $Hb(O)_2$, respectively are :

(1) paramagnetic and paramagnetic

(2) diamagnetic and diamagnetic

(3) paramagnetic and diamagnetic

(4) diamagnetic and paramagnetic

87. The ring size and the number of linked tetrahedral present in $[Si_6O_{18}]^{12-}$ are, respectively :

(1) 6 and 6 (2) 12 and 6 (3) 12 and 12 (4) 6 and 12

88. The IUPAC nomenclature of $Na[PCl_6]$ is :

(1) Sodium hexachlorophosphine (V)

(2) Sodium hexachlorophosphate (V)

(3) Sodium hexachlorophosphine

(4) Sodium hexachlorophosphite (V)

89. Coordination number and geometry of $[Ce(NO_3)_6]^{2-}$ is :

(1) 6, Octahedral (2) 12, Octahedral

(3) 8, Dodecahedral (4) 12, Icosahedral

90. Which of the following has highest lattice energy ?

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97. The rotational constant B for the *HCl* molecule is 10.6 cm^{-1}. The frequency for the pure rotation transition $J = 0 \rightarrow J = 1$ is equal to :

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D

SET-Y

PG-EE-2022

SUBJECT : Chemistry

11472

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Father's Name _____

Mother's Name _____ Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. Identify the strongest Bronsted acid :

(1) H_2SO_4 (2) CH_3COOH (3) HNO_3 (4) H_3PO_4

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(1) Ca^{2+} (2) Na^{+} (3) Cu^{2+} (4) Cd^{2+}

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10. Which of the following has highest lattice energy ?

(1) KF (2) NaF (3) CsF (4) RbF

11. Sulphaguanidine, a sulpha drug is used for the treatment of :

(1) Eye diseases

(2) Bacillary dysentery

(3) Pneumonia

(4) Skin infections

12. Which of the following is a product formed in Claisen Condensation ?

(1) β-ester

(2) β-ketone

(3) β- keto ester

(4) γ-diketone

13. Bakelite is a condensation polymer of phenol and formaldehyde. The initial step between two compounds is an example of :

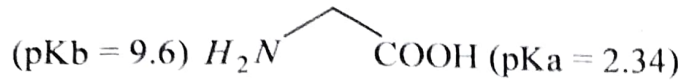
(1) Free radical reaction

(2) Aldol condensation

(3) Aromatic nucleophilic substitution

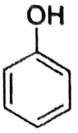
(4) Aromatic electrophilic substitution

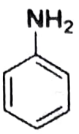
14. The isoelectric point of the amino acid is :

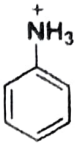


(1) 3.35 (2) 10.64 (3) 5.97 (4) 8.02

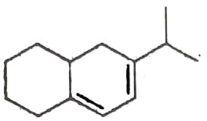
15. Which of the following absorbs at more wavelength ?

(1)  (2) 

(3) 

(4) 

16. Calculate the maximum wavelength of the following compound according to Woodward Fieser rules :



(1) 278 nm (2) 273 nm (3) 283 nm (4) 290 nm

17. What is the relation between restoring force, f to the displacement, q in the Hooke's law ?

(1) $f = -kq$ (2) $f = kq$ (3) $f = kq^2$ (4) $f = -kq^2$

18. What is the order of decreasing vibrational frequency for C–Cl, C–Br, C–C, C–O and C–H ?

(1) C–Cl, C–Br, C–C, C–H, C–O

(2) C–O, C–H, C–Br, C–Cl, C–C

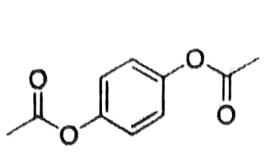
(3) C–Br, C–Cl, C–O, C–C, C–H

(4) C–H, C–C, C–O, C–Cl, C–Br

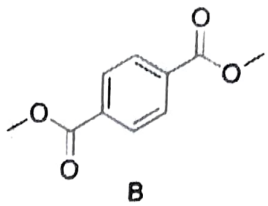
19. How many methyl peaks would you expect to observe in the ^{1}H NMR spectrum of *cis*-1,4- dimethylcyclohexane ?

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

20. Compounds A and B exhibit two singlets, each in their ^1H NMR spectra. The expected chemical shifts are at δ :



A



B

(1) 6.9 and 3.9 for A; 7.7 and 2.1 for B

(2) 7.7 and 2.1 for A; 6.9 and 3.9 for B

(3) 7.7 and 3.9 for A; 6.9 and 2.1 for B

(4) 6.9 and 2.1 for A; 7.7 and 3.9 for B

21. Identify the compound with highest ring strain ?

(1) Cyclohexane

(2) Cyclopropane

(3) Cyclobutane

(4) Cyclopentane

22. Which alkene on ozonolysis gives CH_3CH_2CHO and CH_3COCH_3 ?

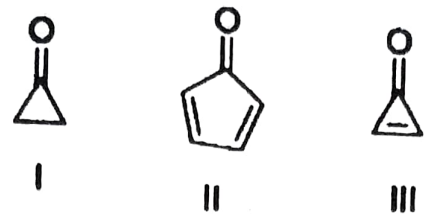
(1) $CH_3CH_2CH = C(CH_3)_2$

(2) $CH_3CH_2CH = CHCH_2CH_3$

(3) $CH_3CH_2CH = CHCH_3$

(4) $(CH_3)_2C = CHCH_3$

23. Arrange the following compounds in increasing order of polarity :



I II III

(1) I < II < III

(2) III < II < I

(3) II < I < III

(4) III < I < II

24. Majority of the alkynes are ***not*** prepared from/ by :

(1) Condensation

(2) Acetylene

(3) Dehydrohalogenation

(4) Hydrogenation

25. In $S_N{}^2$ reaction of *cis*-3-methylcyclopentyl bromide with aqueous alkali, the product formed is :

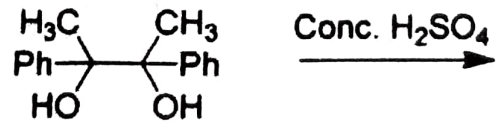
(1) a *cis*-alcohol

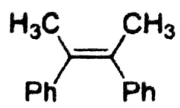
(2) a *trans*-alcohol

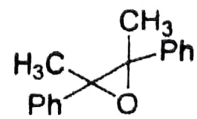
(3) an equimolecular mixture of *cis* and *trans*-alcohols

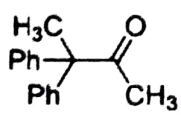
(4) there is no reaction

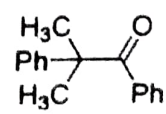
26. Product A in this reaction is :



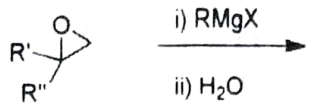
(1) 

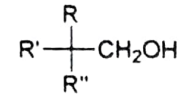
(2) 

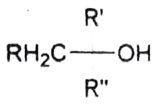
(3) 

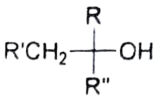
(4) 

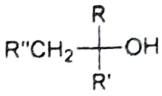
27. The product obtained in the following reaction is :



(1) 

(2) 

(3) 

(4) 

28. Which reagent can distinguish ethanol and phenol ?

(1) $SOCl_2$ (2) CH_3COCl

(3) $(CH_3CO)_2O$ (4) CH_3COOH

29. $CH_3CHO + HCN \rightarrow \xrightarrow{H_3O^+}$

The product is a :

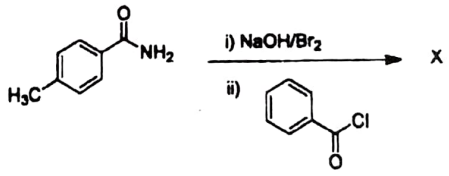
(1) Mixture of 1 : 1 enantiomers of acid

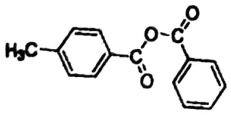
(2) Mixture of 1 : 1 diastereomers of acid

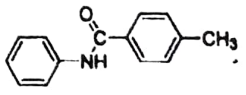
(3) Mixture of 1 : 2 enantiomers of acid

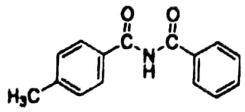
(4) Mixture of 1 : 1 enantiomers of aldehyde

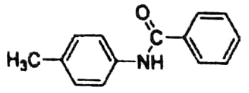
30. The structure of the product *X* is :



(1) 

(2) 

(3) 

(4) 

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(1) 8 (2) 5

(3) 20 (4) 10

37. The rotational constant B for the HCl molecule is 10.6 cm^{-1}. The frequency for the pure rotation transition $J = 0 \rightarrow J = 1$ is equal to :

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38. The fundamental vibration frequency of N_2 is 2334 cm^{-1}. The force constant for the molecule will be :

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41. Which of the following are arranged in order of increasing radius ?

(1) $K^+(aq) < Na^+(aq) < Li^+(aq)$

(2) $K^+(aq) < Li^+(aq) < Na^+(aq)$

(3) $Li^+(aq) < K^+(aq) < Na^+(aq)$

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(3) $Li^+(aq) < K^+(aq) < Na^+(aq)$

(4) $Na^+(aq) < Li^+(aq) < K^+(aq)$

42. The number of antibonding electrons in NO and CO according to MO theory are respectively :

(1) 1, 0 (2) 2, 2

(3) 3, 2 (4) 2, 3

43. Ozone present in upper atmosphere protects people on earth :

(1) due to its diamagnetic nature

(2) due to its blue colour

(3) due to absorption of radiation of wavelength at 255 nm

(4) by destroying chlorofluoro carbons

44. The temperature at which RMS velocity of SO_2 molecules is half that of He molecules at 300 K is :

(1) 150 K (2) 600 K

(3) 900 K (4) 1200 K

45. The mean free path of oxygen molecules at 0°C and one atmospheric pressure will be equal to (molecular diameter of oxygen molecule is 2.0×10^{-8} cm) :

(1) 2.1×10^{-5} cm (2) 4.2×10^{-5} cm

(3) 2.9×10^{-5} cm (4) 1.0×10^{-8} cm

46. What will be the Vander Waal's constant b for carbon dioxide in lit mol^{-1} (given that $T_c = 304$ K and $P_c = 73$ atm) ?

(1) 0.043 (2) 2.732

(3) 0.341 (4) 4.164

47. What happens to the viscosity of liquid with the increase in temperature ?

(1) It increases (2) It decreases

(3) It may increase or decrease (4) No change

P. T. O.

48. Which of the following statements is ***not*** true about smectic liquid crystals ?

(1) They have limited mobility

(2) They do not flow as normal liquids

(3) The concept of viscosity is applicable to them

(4) They show X-ray diffraction patterns

49. Rate constant of a reaction can be expressed by Arrhenius equation as : $k = Ae^{\frac{-E_a}{RT}}$. In this equation, E_a, represents :

(1) The energy above which all the colliding molecules will react

(2) The energy below which the colliding molecules will not react

(3) The total energy of the reacting molecules at a temperature T

(4) The fraction of molecules with energy greater than the activation energy

50. Which of the following statements is true in the Transition State Theory (TST) ?

(1) TST fails for some reactions at high temperature

(2) Activated complex is in quasi-equilibrium with the reactants

(3) TST is not applicable when the intermediates are very short-lived

(4) All of the above

51. Among the following, metal carbonyl species having highest υ_{CO} stretching frequency is :

(1) $[Mn(CO)_6]^+$ (2) $[Cr(CO)_6]$ (3) $[V(CO)_6]^-$ (4) $[Fe(CO)_4]^{2-}$

52. Glauber's salt is :

(1) $MgSO_4.7H_2O$ (2) $Na_2SO_4.10H_2O$

(3) $CuSO_4.5H_2O$ (4) $FeSO_4.7H_2O$

53. The colour of CuS is :

(1) Black (2) Yellow (3) Blue (4) White

54. A 3p atomic orbital has :

(1) one radial node and one angular node

(2) two angular nodes

(3) one angular node

(4) one radial node

55. The geometry around the central atom in the ClF_4^+ is :

(1) square planar (2) square pyramidal

(3) octahedral (4) trigonal bipyramidal

56. Which of the following ions is not expected to be coloured ?

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

(3) Ti^{3+} (4) Cu^{+}

57. The S and L values for ^{15}N atom respectively, are :

(1) 1/2 and 1 (2) 1/2 and 0

(3) 1 and 0 (4) 3/2 and 0

58. Chelate effect is :

(1) Predominantly due to enthalpy change

(2) Predominantly due to entropy change

(3) Independent of ring size

(4) Due to equal contribution of entropy and enthalpy change

59. The red colour of oxyhaemoglobin is mainly due to the :

(1) d-d transition

(2) Metal to ligand charge transfer transition

(3) Intraligand $\pi-\pi^*$ transition

(4) Ligand to metal charge transfer transition

60. Which of the following does not obey 18 e^- rule ?

(1) $[Cr(CO)_6]$ (2) $[Fe(CO)_5]$

(3) $[V(CO)_6]$ (4) $[Mn_2(CO)_{10}]$

61. Ostwald dilution law is applicable to :

(1) Strong electrolytes only (2) Weak electrolytes only

(3) non electrolytes (4) Strong as well as weak electrolytes

62. Which of the following is ***not*** a type of acidic buffer solution ?

(1) $Na_2HPO_4 + Na_3PO_4$ (2) $CH_3COOH + CH_3COONa$

(3) $H_2CO_3 + Na_2CO_3$ (4) $H_3PO_4 + NaH_2PO_4$

63. When a large ion is replaced by a small ion, the conductivity of the solution :

(1) Decreases (2) Increases

(3) Remains unchanged (4) None of the above

64. All of the following are intensive properties except :

(1) Mass (2) Viscosity

(3) Density (4) Temperature

65. In an isothermal process change in internal energy :

(1) Decreases (2) Increases

(3) Remains constant (4) Becomes zero

66. The ratio of the rise in temperature of a gas when compressed adiabatically to that when compressed isothermally to the same extent is :

(1) Less than 1

(2) More than 1

(3) Equal to 1

(4) Depends on the gas

67. Three Carnot engines A, B and C have source temperatures 750 K, 700 K & 650 K and sink temperatures 400 K, 350 K & 300 K respectively. Which engine is the least efficient ?

(1) Engine A

(2) Engine B

(3) Engine C

(4) All have the same efficiencies

68. For the reaction; $SBr_4(g) \rightarrow S(g) + 2Br_2(l)$; $\Delta H^\circ = +115$ kJ and $\Delta S^\circ = +125$ J/K at 25°C. ΔG° for the reaction at 25°C will be :

(1) +152.00kJ (2) −56.75 kJ (3) +77.75 kJ (4) +37.10 kJ

69. When pressure is applied to ice $\rightleftharpoons$ water system, which of the following will happen ?

(1) More ice is formed

(2) Water will evaporate

(3) The system will not be in equilibrium

(4) More water is formed

70. The partition coefficient of iodine between carbon tetrachloride and water is 90. The volume of carbon tetrachloride required for 95% of the iodine to be extracted from 100 ml of aqueous solution will be equal to :

(1) 21.1 ml (2) 60.5 ml (3) 95.0 ml (4) 90.0 ml

71. A Spin inversion of electrons takes place in which of the following ?

(1) Internal conversion

(2) Fluorescence

(3) Phosphorescence

(4) None of the above

72. If 1.5 grams of a non-volatile solute ($M_w = 100$) is added to 200 ml of pure CS_2 (ρ = 1.3 g/cc) whose vapor pressure is 400 mm of Hg at 27.0°C, what is the resulting vapor pressure of the dilute solution ?

(1) 382.15 mm Hg (2) 396.60 mm Hg

(3) 401.75 mm Hg (4) 398.25 mm Hg

73. At 27°C the osmotic pressure of a 0.01 M solution of a compound is 0.492 atm. The Van't Hoff factor will be equal to :

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

74. Boiling point of chloroform is 61°C. After addition of 5.0 g of a non-volatile solute to 20 g chloroform the solution boils at 64.63°C. If $K_b = 3.63$ K kg mol^{-1}, what is the molecular weight of the solute ?

(1) 320 (2) 100 (3) 250 (4) 400

75. In which of the following equilibrium either P or T can be changed independently ?

(1) Invariant (2) Univariant (3) Divariant (4) All of the above

76. Which is a metastable equilibrium in sulphur system ?

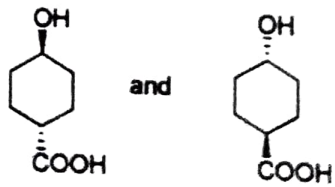
(1) $S_r \rightleftarrows S_m \rightleftarrows S_v$ (2) $S_m \rightleftarrows S_l \rightleftarrows S_v$

(3) $S_m \rightleftarrows S_r \rightleftarrows S_l$ (4) $S_r \rightleftarrows S_l \rightleftarrows S_v$

77. Number of hyperconjugation structures in isopropyl radical is :

(1) 3 (2) 6 (3) 9 (4) 12

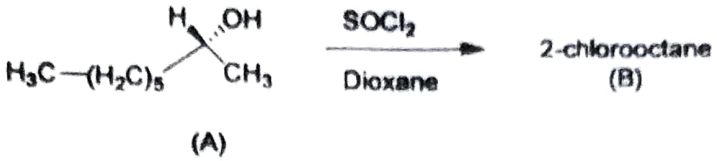
78. The given compounds are :



(1) Diastereomers (2) Enantiomers

(3) Identical (4) Regioisomers

79. The statement that is true about the reaction given below is :



(A)

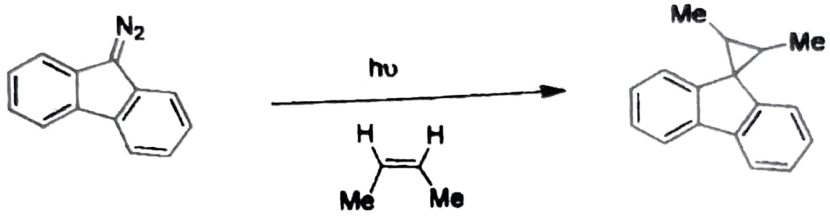
(1) (A) and (B) both are R-isomers

(2) (A) and (B) both are S-isomers

(3) (A) is R-isomer and (B) is S-isomer

(4) (A) is S-isomer and (B) is R-isomer

80. Which intermediate is involved in the following reaction ?



(1) Free radical

(2) Carbocation

(3) Carbanion

(4) Carbene

81. The strength of pπ-dπ bonding in A–O (A = Si, P, S, C) follows the order :

(1) Si – O > P – O > S – O > Cl – O

(2) P – O > Si – O > S – O > Cl – O

(3) S – O > Cl – O > P – O > Si – O

(4) Cl – O > S – O > P – O > Si – O

82. The order of acidity in boron trihalides is :

(1) $BF_3 > BCl_3 > BBr_3$

(2) $BBr_3 > BCl_3 > BF_3$

(3) $BF_3 > BBr_3 > BCl_3$

(4) $BBr_3 > BF_3 > BCl_3$

83. The stable oxidation state of Au is :

(1) I (2) III (3) V (4) –I

84. Xenon forms several fluorides and oxofluorides which exhibit acidic behavior. The correct sequence of descending Lewis acidity among the given species is represented by :

(1) $XeF_6 > XeOF_4 > XeF_4 > XeO_2F_2$

(2) $XeOF_4 > XeO_2F_2 > XeF_4 > XeF_6$

(3) $XeF_4 > XeO_2F_2 > XeOF_4 > XeF_6$

(4) $XeF_4 > XeF_6 > XeOF_4 > XeO_2F_2$

85. The spin only (μ_s) magnetic moment of $[CrCl_6]^{3-}$:

(1) 3.87 BM (2) 2.84 BM (3) 6.87 BM (4) 5.20 BM

86. The total number of isomers of $Co(en)_2Cl_2$ (en = ethylenediamine) is :

(1) 4 (2) 3 (3) 6 (4) 5

87. The tripositive lanthanides ion which does not show sharp peak in its absorption spectrum :

(1) Ce^{3+} (2) Pr^{3+} (3) Gd^{3+} (4) Pm^{3+}

88. Among the following anions (i) CH_3^- (ii) NH_2^- (iii) OH^- (iv) F^-, the order of basicity is :

(1) i > ii > iii > iv (2) ii > i > iii > iv

(3) iii > ii > i > iv (4) iii > i > ii > iv

89. The order of polarity of NH_3, NF_3 and BF_3 is :

(1) $NH_3 < NF_3 < BF_3$ (2) $BF_3 < NF_3 < NH_3$

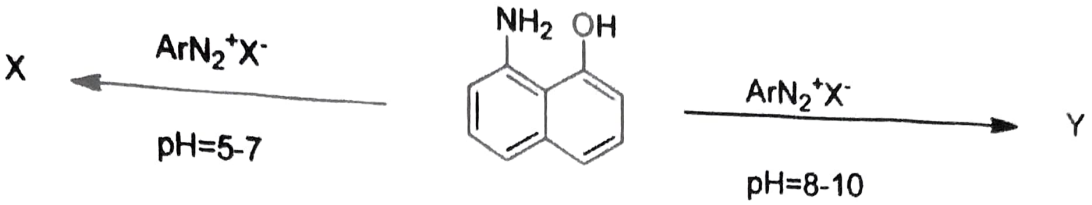
(3) $BF_3 < NH_3 < NF_3$ (4) $NF_3 < BF_3 < NH_3$

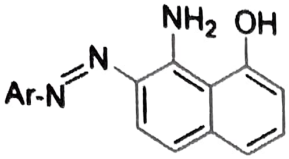
90. Silicates with continuous 3D framework are :

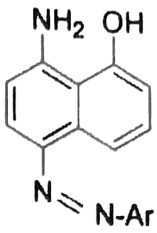
(1) Neso-Silicates (2) Soro-Silicates

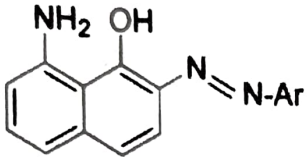
(3) Phyllo-Silicates (4) Tecto-Silicates

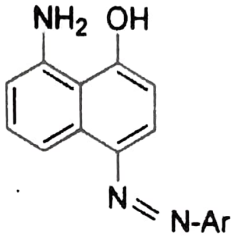
91. X and Y respectively are :

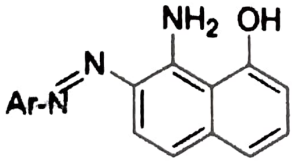


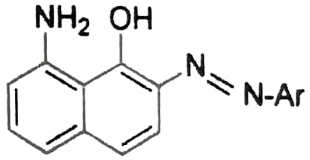
(1) 

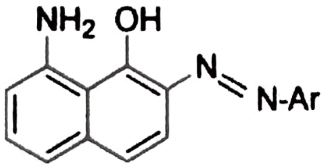


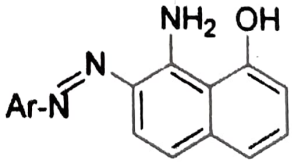
(2) 



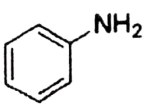
(3) 

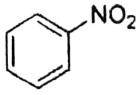


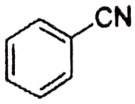
(4) 

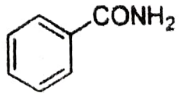


92. A nitrogen containing aromatic compound A reacts with *Sn/HCl* followed by HNO_2 to give an unstable compound *B*. *B* on treatment with phenol forms a coloured compound *C* with molecular formula $C_{12}H_{10}N_2O$. The structure of compound *A* is :

(1) 

(2) 

(3) 

(4) 

93. Wolf-Kishner reduction is the reduction of :

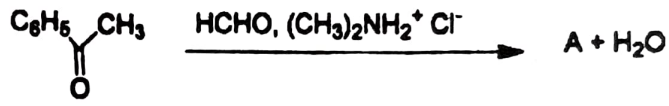
(1) Carbonyl compounds into hydrocarbons

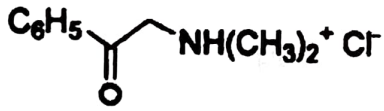
(2) Carbonyl compounds into alcohols

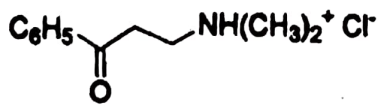
(3) Nitrobenzene into aniline

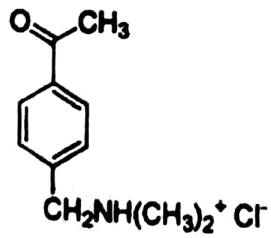
(4) Carbohydrates into alcohols

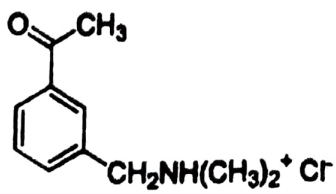
94. The product A formed in the following reaction is :



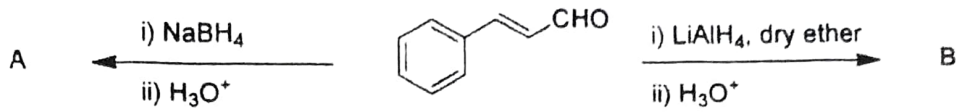
(1) 

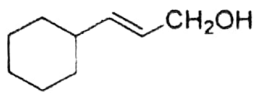
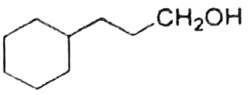
(2) 

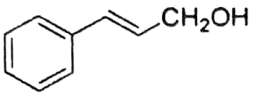
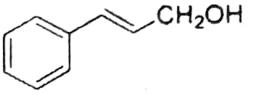
(3) 

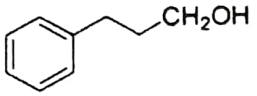
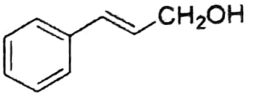
(4) 

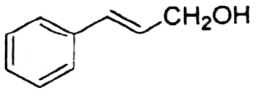
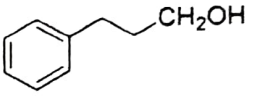
95. The major products A and B respectively for the following reaction are :



(1) A =  B = 

(2) A =  B = 

(3) A =  B = 

(4) A =  B = 

96. α–D–(+)-glucose and β-D-(+)-glucose are :

(1) Anomers

(2) Enantiomers

(3) Geometrical isomers

(4) Epimers

97. Which of the following statement is ***correct*** ?

(1) The Ruff procedure lengthens an aldose chain and gives a single product.

(2) The Ruff procedure shortens an aldose chain and gives two epimers.

(3) The Kiliani-Fisher procedure lengthens an aldose chain and gives two epimers.

(4) The Kiliani-Fisher procedure shortens an aldose chain and gives a single product.

98. Which of the following reagents, when treated with phenyl magnesium bromide followed by acid workup, will yield 2-phenylethanol ?

(1) Diethyl ether

(2) Ethanol

(3) Ethanal

(4) Oxirane

99. The order of aromaticity of furan, thiophene and pyrrole is :

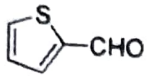
(1) Thiophene > furan > pyrrole

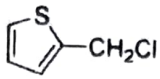
(2) Furan > pyrrole > thiophene

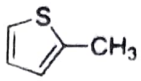
(3) Thiophene > pyrrole > furan

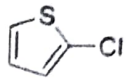
(4) Pyrrole > thiophene > furan

100. Thiophene reacts with HCHO in the presence of aq. HCl to give :

(1) 

(2) 

(3) 

(4) 

ANSWER KEYS OF CHEMISTRY FOR SESSION 2022-23				
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2	2	1	1	4
3	2	3	2	3
4	1	4	1	4
5	1	2	3	1
6	3	3	2	2
7	1	2	1	2
8	1	1	3	2
9	2	1	4	4
10	4	4	1	2
11	1	3	1	2
12	4	1	2	3
13	3	2	1	4
14	4	4	1	3
15	1	2	4	3
16	2	3	4	1
17	2	2	4	1
18	2	1	2	4
19	4	2	3	3
20	2	2	3	4
21	1	3	4	2
22	2	2	2	1
23	1	1	2	3
24	1	2	1	4
25	4	4	1	2
26	4	1	3	3
27	4	3	1	2
28	2	4	1	1
29	3	3	2	1
30	3	2	4	4
31	1	1	2	3
32	1	4	3	1
33	3	3	4	2
34	4	4	3	4
35	1	1	3	2
36	1	2	1	3
37	2	2	1	2
38	3	2	4	1
39	2	4	3	2
40	4	2	4	2
41	2	2	3	1
42	1	3	4	1
43	2	4	2	3
44	1	3	3	4
45	3	3	2	1
46	2	1	4	1
47	1	1	2	2
48	3	4	3	3
49	4	3	1	2
50	1	4	4	4

Kamal

Sangeeta Yadav

ANSWER KEYS OF CHEMISTRY FOR SESSION 2022-23				
Q. NO.	A	B	C	D
51	3	3	1	1
52	1	4	1	2
53	2	2	3	1
54	4	3	4	1
55	2	2	1	4
56	3	4	1	4
57	2	2	2	4
58	1	3	3	2
59	2	1	2	3
60	2	4	4	3
61	3	1	2	2
62	4	1	1	1
63	2	3	3	2
64	3	4	4	1
65	2	1	2	3
66	4	1	3	2
67	2	2	2	1
68	3	3	1	3
69	1	2	1	4
70	4	4	4	1
71	2	2	3	3
72	1	1	2	4
73	3	2	1	2
74	4	1	2	3
75	2	3	4	2
76	3	2	1	4
77	2	1	3	2
78	1	3	4	3
79	1	4	3	1
80	4	1	2	4
81	3	1	1	4
82	2	2	4	2
83	1	1	3	2
84	2	1	4	1
85	4	4	1	1
86	1	4	2	3
87	3	4	2	1
88	4	2	2	1
89	3	3	4	2
90	2	3	2	4
91	2	4	3	3
92	3	2	1	2
93	4	2	2	1
94	3	1	4	2
95	3	1	2	4
96	1	3	3	1
97	1	1	2	3
98	4	1	1	4
99	3	2	2	3
100	4	4	2	2

ted

Komal

Geeta Yadav