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A

SET-Y

PG-EE-2021

SUBJECT : Chemistry

10133

Sr. No. .....

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

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SEAL

1. d-block elements show all the following properties except :

(1) variable oxidation states

(2) catalytic properties

(3) natural radioactivity

(4) colour of the compounds

2. *Mo* and *W* belong to group of :

(1) Cu

(2) Mn

(3) Fe

(4) Cr

3. The complexes $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are examples of :

(1) geometrical isomers

(2) co-ordination isomers

(3) linkage isomers

(4) position isomers

4. The number of unpaired electron in a d^7 tetrahedral configuration is :

(1) 3

(2) 2

(3) 1

(4) 7

5. In general, a metal complex is regarded as stable if its log β value is :

(1) Zero

(2) less than 8

(3) more than 8

(4) 14

6. The spin only magnetic moment for Co^{2+} ion in :

(1) 4.90 B.M.

(2) 3.87 B.M.

(3) 2.84 B.M.

(4) 1.73 B.M.

7. For laporte forbidden transitions :

(1) $\Delta l = 0$

(2) $\Delta s = 0$

(3) $\Delta l = -1$

(4) $\Delta l = \pm 1$

8. Which of the following does not belong to lanthanides ?

(1) Nd

(2) Tm

(3) Cm

(4) Ce

9. The oxidation state of U in UO_2^{2+} is :

(1) 4

(2) 2

(3) 6

(4) 3

10. An example of olefin complex is :

(1) Ferrocene

(2) Zeise salt

(3) Bis $\left(\eta^6 \text{ - benzene chromium}\right)$

(4) $(CO)_6\, CO_2 (Phc \equiv cPh)$

11. Silicones have the structural unit :

(1) $\left[- \underset{\underset{R}{|}}{\overset{\overset{O}{||}}{Si}} - \right]$

(2) $\left[- \underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}} - O - \right]$

(3) $\left[- \underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}} = O - \right]$

(4) $\left[- \underset{\underset{R}{|}}{\overset{\overset{O}{|}}{Si}} - \underset{\underset{R}{|}}{\overset{\overset{O}{|}}{Si}} - \right]$

12. Which of the following is ***not*** a hard acid ?

(1) Na^+

(2) Mg^{2+}

(3) Pd^{2+}

(4) Ti^{4+}

13. The term hard and soft acid and base was given by :

(1) Bronsted (2) Lewis

(3) Pearson (4) Franklin

14. Which of the following is ***not*** a protonic solvent ?

(1) HF (2) H_2O

(3) $CHCl_3$ (4) H_2SO_4

15. Which of the following does not belong to group III of basic radicals ?

(1) Al^{3+} (2) Cr^{3+}

(3) Bi^{3+} (4) Fe^{3+}

16. The colour of cus is :

(1) black (2) yellow

(3) blue (4) white

17. O_2 is bound to heme in a :

(1) bent way (2) linear arrangement

(3) Tetrahedral arrangement (4) Bridged way

18. The covalent character of alkali metal halides increases as (for some alkali metal) :

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

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

19. The peroxide of alkali metals contain an ion which is isoelectronic with :

(1) O_2 (2) O_2^-

(3) N_2 (4) F_2

20. Inorganic berzene in :

(1) (BN) (2) $B_3N_3H_6$

(3) B_6H_{10} (4) B_6H_{12}

21. Hydrazoic acid is :

(1) $H_4P_2O_7$ (2) HNO_4

(3) HN_3 (4) NH_3

22. Pyrosilicates contain the discrete silicate ion :

(1) $Si_2O_7^{6-}$ (2) $Si_3O_9^{6-}$

(3) $Si_6O_{18}^{12-}$ (4) $(SiO_3)_n^{2n-}$

23. The correct order of acidic strength in :

(1) $HClO > HIO > HBrO$ (2) $HIO > HBrO > HClO$

(3) $HClO > HBrO > HIO$ (4) $HBrO > HClO > HIO$

24. The shape of interhalogen ion, ICl_2^- is :

(1) Square planar (2) Trigonal planar

(3) Linear (4) Tetrahedral

25. Which noble gas forms maximum components ?

(1) Xenon

(2) Krypton

(3) Argon

(4) Helium

26. Hydrogen bonding is ***not*** present in :

(1) HF

(2) NH_3

(3) HCl

(4) H_2O

27. To prepare P-type semi-conductor, germanium may be doped with :

(1) P

(2) As

(3) In

(4) Sb

28. How many orbitals can have the following numbers, $n = 3$, $l = 1$, $m = 0$

(1) 4

(2) 2

(3) 1

(4) 3

29. 3P orbital has radial nodes :

(1) three

(2) two

(3) one

(4) none

30. The correct order for the size of I, I^+, I^- is :

(1) $I > I^- > I^+$

(2) $I > I^+ > I^-$

(3) $I^- > I > I^+$

(4) $I^+ > I^- > I$

31. The correct order of electronegativity is :

(1) $Cl > F > O > Br$ (2) $F > O > Cl > Br$

(3) $F > Cl > Br > O$ (4) $O > F > Cl > Br$

32. Find the molecule in which the central atom is having one lone pair of electrons :

(1) NH_3 (2) FCl_5

(3) H_2O (4) CH_4

33. How many molecules are there in the unit cell of sodium chloride :

(1) 2 (2) 4

(3) 6 (4) 8

34. Which has maximum value of mean free path :

(1) CO_2 (2) H_2

(3) O_2 (4) N_2

35. For critical constants compression factor Z is :

(1) 1 (2) > 1

(3) < 1 (4) 0

36. The temperature at which a real gas obeys the ideal gas laws over a fairly wide range of pressure is :

(1) Critical temperature (2) Inversion temperature

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

37. If detergent is added :

(1) Surface tension decreases

(2) Surface tension increases

(3) Surface tension can decrease or increase

(4) no effect

38. A compound is formed by elements A & B and is cubic. A atoms are at the corners and B atoms are at the face centers. What is the formula ?

(1) AB (2) AB_2

(3) AB_3 (4) A_3B

39. A reaction takes place by following mechanism

$A + BC \rightarrow AC + B$

$AC + D \rightarrow A + CD$

Reactants are :

(1) A, BC (2) BC, D

(3) AC, D (4) A, BC, D

40. The rate of chemical reaction generally increases rapidly even for small temperature increase because of rapid increase in the :

(1) Fraction of molecules with energies in excess of activation energy

(2) Average kinetic energy of molecules

(3) Activation energy

(4) Collision frequency

41. Which has maximum value of $\wedge_{eq}$. at constant temperature assuming 100% ionization of each electrolyte :

(1) 0.1 $M\,H_2SO_4$ (2) 0.1 $M\,H_3PO_3$

(3) 0.1 $M\,H_2PO_4^-$ (4) equal

42. In the variation of $\wedge_m$ with $\sqrt{C}$, $\wedge_m = \wedge_m^\infty \left(A + B \wedge_m^\infty\right)\sqrt{C}$, A & B called :

(1) Vander Waal's constant (2) Critical constants

(3) Onsagar constants (4) Debye-Huckel constants

43. Specific conductance has unit :

(1) ohm-cm (2) ohm $^{-1}$ cm

(3) ohm cm $^{-1}$ (4) ohm $^{-1}$ cm $^{-1}$

44. Which has the maximum internal energy :

(1) Helium gas (2) Oxygen gas

(3) Ozone gas (4) equal

45. Which is ***not*** a state function :

(1) q (2) H

(3) E (4) G

46. Select the correct alternate about entropy :

(1) $\lim_{T\to\infty} S = 0$ (2) $\lim_{T\to 0} S = \infty$

(3) $\lim_{T\to 0} S = 0$ (4) $S_{(liquid)} > S_{(vapour)}$

47. When one mole of an ideal gas is compared to half its initial volume and simultaneously heated to twice its initial temperature, the change in entropy (ΔS) is :

(1) $C_v \ln 2$

(2) $C_p \ln 2$

(3) $R \ln 2$

(4) $(C_v - R) \ln 2$

48. $H_2O(g) \rightarrow H(g) + OH(g)\ \Delta H = x_1$

$OH(g) \rightarrow H(g) + O(g)\ \Delta H = x_2$

Based on these value bond energy of $O - H$ bond is :

(1) $x_1 + x_2$

(2) $\frac{x_1 + x_2}{2}$

(3) $\frac{x_1 - x_2}{2}$

(4) $2(x_1 + x_2)$

49. In the following equilibrium :

I $A + 2B \rightleftharpoons C, K_{eq} = K_1$

II $C + D \rightleftharpoons 3A\ K_{eq} = K_2$

III $6B + D \rightleftharpoons 2C\ K_{eq} = K_3$

hence :

(1) $3K_1 + K_2 = K_3$

(2) $K_1^3 + K_2^2 = K_3$

(3) $3K_1 + K_2^2 = K_3$

(4) $K_1^3 + K_2 = K_3$

50. Half cell reaction for a half-cell

$Hg(l) + 2OH^-(aq) \rightarrow HgO(S)H_2O(l) + 2e^-$

This half cell is reversible to :

(1) $H_2O(l)$

(2) $HgO(S)$

(3) $OH^-(aq)$

(4) All are correct

51. Which of the following statements about a reaction occurring in galvanic cell is true :

(1) If $E^{\circ}_{cell} > 0$ $\Delta G < 0$

(2) If $E^{\circ}_{cell} < 0$ $\Delta G < 0$

(3) If $E^{\circ}_{cell} < 0$ $K_{cq} > 1$

(4) If $E^{\circ}_{cell} > 0$ $K_{eq} > 1$

52. Electrical potential of a cell is :

(1) An intensive property

(2) An extensive property

(3) An isothermal property

(4) An isobaric property

53. The Nernst distribution law $K_D = {}^{C_1}\!/_{C_2}$ is not applicable, if the solute undergoes :

(1) association in one of the solvents

(2) dissociation in one of the solvents

(3) association and dissociation in one of the solvents

(4) none of the above

54. Classical mechanics does not provide satisfactory explanation for the following :

(1) Black-body radiation

(2) Photoelectric effect

(3) Heat capacities of solids

(4) All of the above

55. Expression for a particle in one dimensional box is :

(1) $E = \frac{n^2h^2}{8ma^2}$

(2) $E = \frac{n^2h^2}{4ma^2}$

(3) $E = \frac{n^2h}{8ma^2}$

(4) $E = \frac{nh^2}{8ma^2}$

56. The substances which retain the magnetic field when removed from the magnetic field are called :

(1) paramagnetic
(2) diamagnetic
(3) ferrimagnetic
(4) ferromagnetic

57. Rotational spectra involve :

(1) a very high energy changes
(2) small energy changes
(3) no energy changes
(4) none of these

58. In the Raman spectrum middle line is called :

(1) Raman line
(2) Rayleigh line
(3) Functional group line
(4) none of these

59. The IR spectra of a compound helps in :

(1) providing the identity of compounds
(2) showing the presence of certain function groups in molecule
(3) neither of above
(4) both of the above

60. The electronic spectra consists of :

(1) a large number of absorption lines
(2) a large number of closely packed lines
(3) a large number of peaks
(4) none of these

61. The light emitted in a chemiluminescent reaction is also called :

(1) Cold light

(2) Hot light

(3) Bright light

(4) None of these

62. Freezing point depression is measured by :

(1) Beckmann's method

(2) Rast's camphor method

(3) Both

(4) none of these

63. Which of the following is a colligative property :

(1) molar refractivity

(2) optical rotation

(3) depression in freezing point

(4) viscosity

64. The law of the relative lowering of vapour pressure was given by :

(1) Von't Hoff

(2) Ostwald

(3) Raoult

(4) Henery

65. In terms of Phases (P), Components (C) and Degree of Freedom (F), the phase rule is expressed as :

(1) P + F = C + 2

(2) P + C = F + 2

(3) F = P + C – 2

(4) P – F = C + 2

66. Lowest temperature is reached by using :

(1) $CaCl_2.H_2O$

(2) Acetone + dry ice

(3) NH_4Cl

(4) Ether + dry ice

67. How many contributing structures are possible in hyperconjugation of toluene ?

(1) 06 (2) 09

(3) 15 (4) 03

68. The conjugation in an organic compound results in shift of U.V. absorption band towards :

(1) Low λ_{max} and low energy (2) High λ_{max} and high energy

(3) High λ_{max} and low energy (4) Low λ_{max} and high energy

69. In I. R. spectroscopy o-hydroxy benzoic acid and meta hydroxy benzoic acid can be differentiated on the basis of :

(1) C – O stretching frequency (2) O – H stretching frequency

(3) C – C stretching frequency (4) O – O stretching frequency

70. Which one of the following species behaves as nucleophile as well as electrophile ?

(1) $:\overset{\oplus}{\underset{\cdot\cdot}{Cl}}:$ (2) $CH_2 = CH_2$

(3) $(CH_3)_3 - C:$ (4) $H_3C \equiv N:$

71. Identify the product of the following reaction.

$$CH_3 - CH_2 - CH_2 - CH_2 - Cl + :\overset{\ominus}{C} \equiv CH \rightarrow \ ?$$

(1) $CH_3 - CH = CH - CH_2 - C \equiv CH$ (2) $CH_3 - CH_2 - CH = CH - C \equiv CH$

(3) $HC \equiv C - CH_2 - CH_2 - CH_2 - CH_3$ (4) $CH_2 = CH - CH = CH - CH_2 - CH_3$

72. In the reaction of $(CH_3)_3 - C - Cl$ with strong base (^-OH), the major product formed is :

(1) $CH_3 - \underset{\underset{CH_3}{|}}{C} = CH_2$

(2) $HO - \underset{\underset{CH_3}{|}}{CH} - CH_3$

(3) $(CH_3)_3 - C - OH$

(4) $HO - CH_2 - \underset{\underset{CH_3}{|}}{C} = CH_2$

73. Arrange the following in increasing order of basicity : $H_2O, ^-OH, CH_3 - OH$ and CH_3O^- :

(1) $H_2O < CH_3 - OH < ^-OH < CH_3O^-$

(2) $CH_3O^- < ^-OH < CH_3 - OH < H_2O$

(3) $CH_3O^- < CH_3 - OH < ^-OH < H_2O$

(4) $^-OH < H_2O < CH_3 - OH < CH_3O^-$

74. Arrange following compounds in order of increasing acidity :-

cyclohexanole, phenol, p-bromophenol and p-methoxy phenol :

(1) Phenol < p-bromophenol < p-methoxy phenol < cyclohexanole

(2) p-methoxy phenol < phenol < p-bromophenol < cyclohexanole

(3) cyclohexanole < phenol < p-methoxy phenol < p-bromophenol

(4) cyclohexanole < p-methoxy phenol < phenol < p-bromophenol

75. What is the product formed when ethylane oxide reacts with phenyl magnesium bromide in presence of H^+ / H_2O using dry ether as solvent :

(1) 1-phenyl ethanol

(2) 2-phenyl ethanol

(3) Phenyl ethyl ether

(4) 2-ethyl phenol

76. What would be the product formed when calcium butanoate is heated along with calcium formate ?

(1) Butanal

(2) Butanoic acid

(3) Butan-i-ol

(4) Hept-4-one

77. o-methoxy toluene on nitration yields which of the following compound as main product :

(1) 2-methoxy-3-nitro toluene (2) 2-methoxy-4-nitro toluene

(3) 2-methoxy-5-nitro toluene (4) 2-methoxy-6-nitro toluene

78. An alkene having molecular formula C_6H_{12} on ozonolysis produces propanol as sole product identify the structure of given alkene from the following :

(1) $CH_3-CH_2-CH=CH-CH_2-CH_3$

(2) $CH_3-CH=CH-CH_2-CH_2-CH_3$

(3) $CH_2=CH-CH_2-CH_2-CH_2-CH_3$

(4) $CH_3-\underset{\underset{CH_3}{|}}{C}=CH-CH_2-CH_3$

79. An optically active compound, molecular formula $C_6H_{12}O$, reacts with 2, 4-dinitrophenyl hydrazine to give a red precipitate and also gives positive haloform test. Identify the structural formula of the compound from the following :

(1) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CO-CH_3$ (2) $CH_3-CH_2-CH_2-CO-CH_2-CH_3$

(3) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-COCH_3$ (4) $CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-CO-CH_3$

80. Fermi resonance is often observed in I.R. spectra of :

(1) Aliphatic alkanes (2) Alcohols

(3) Carbonyl compounds (4) None of the above

81. How many types of magnetically equivalent protons are present in $CH_3-O-CH_2-C-(CH_3)_3$:

(1) Five (2) Three (3) Fourteen (4) Two

82. The order of chemical shift values (δ) in ^1H-NMR for $CH_3F, CH_3-Cl, CH_3-Br, CH_3I$ and CH_3OH is :

(1) $CH_3OH > CH_3F > CH_3-Cl > CH_3-Br > CH_3I$

(2) $CH_3F > CH_3OH > CH_3-Cl > CH_3-Br > CH_3I$

(3) $CH_3I > CH_3-Br > CH_3-Cl > CH_3F > CH_3OH$

(4) $CH_3F > CH_3-Cl > CH_3-Br > CH_3I > CH_3OH$

83. The calculated peak value for λ_{max} in U.V. spectra for 2-methyl acetophenone is :

(1) 249 n.m.

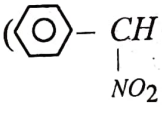
(2) 340 n.m.

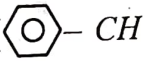
(3) 234 n.m.

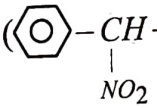
(4) 261 n.m.

84. Identify the product farmed by the reaction between nitromethane and benzaldehyde in presence of alcoholic KOH :

(1) $C_6H_5-CH_2-CH_2-NO_2$ ()

(2) $C_6H_5-\underset{\underset{NO_2}{|}}{CH}-CH_3$ ()

(3) $C_6H_5CH=CH-NO_2$ ()

(4) $C_6H_5-\underset{\underset{NO_2}{|}}{CH}-CH_2-NO_2$ ()

85. Select the correct increasing order of reactivity of the following carbonyl compounds in nucleophillic addition reactions :-

Benzaldehyde, p-tolualdehyde, p-nitrobenzaldehyde and acetophenone :

(1) Benzaldehyde < p–tolualdehyde < p-nitrobenzaldehyde < acetophenone.

(2) p-nitrobenzaldehyde < p-tolualdehyde < benzaldehyde < acetophenone

(3) Acetophenone < benzaldehyde < p-tolualdehyde < p-nitrobenzaldehyde

(4) Acetophenone < p-tolualdehyde < benzaldehyde < p-nitrobenzaldehyde

86. When p-methoxy benzaldehyde is treated with formaldehyde in presence of *NaOH*, the product formed is an alcohol alongwith sodium formate. Identify the type of reaction :

(1) Cannizzaro reaction
(2) Crossed cannizzaro reaction
(3) Intramolecular cannizzaro reaction
(4) Not a feasible reaction

87. Select the correct increasing order of basicity of the following compounds :-

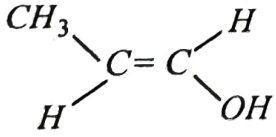
Ethyl amine, pyrrole, pyridine and piperidine.

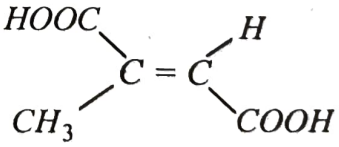
(1) Pyridine < pyrrole < piperidine < Ethyl amine
(2) Piperidine < pyridine < pyrrole < Ethyl amine
(3) Pyrrole < pyridine < piperidine < Ethyl amine
(4) Pyridine < piperidine < pyrrole < Ethyl amine

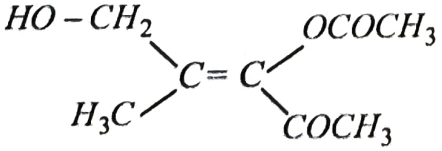
88. Which one of the following is ***not*** a correct statement for 'configurations' concept :

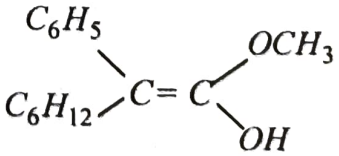
(1) 'Configurations' are three dimensional arrangements in space of the atoms in a molecule which are not interconvertible by rotation around a bond
(2) The interconversion does not require breaking and making of bond
(3) The existence is involved in phenomena of geometrical and optical isomerism
(4) Configurational isomers can exist as pure individual substance.

89. Designate the 'E' and 'Z' nomenclature to the following compounds and select the ***correct*** order from the options given below :

(i) 

(ii) 

(iii) 

(iv) 

(1) (i) E, (ii) Z, (iii) E, (iv) E
(2) (i) E, (ii) E, (iii) E, (iv) Z
(3) (i) Z, (ii) E, (iii) E, (iv) Z
(4) (i) Z, (ii) Z, (iii) E, (iv) E

90. Arrange the following alkanes in increasing order of their boiling points :-

Pentane, 2-methyl hexane, 2-methyl butane and heptane.

(1) Pantane < 2–methyl butane < 2-methyl hexane < heptane

(2) 2-methyl butane < 2-methyl hexane < pentane < heptane

(3) Heptane < pentane < 2-methyl hexane < 2-methyl butane

(4) 2-methyl butane < pentane < 2-methyl hexane < heptane

91. Identify the ***incorrect*** statement from the following :

(1) Thiophene is more aromatic than furan

(2) Pyrrole is more basic than pyridine

(3) Furan is not stable to acid although it has aromatic character

(4) Pyridine is a weaker base than trimethyl amine

92. Which one is the major product obtained form nitration of quinoline with $(HNO_3 + H_2SO_4)$:

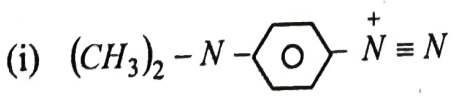
(1) 8-nitroquinoline

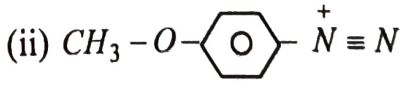
(2) 4-nitroquinoline

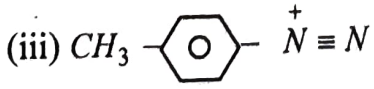
(3) 5-nitroquinoline

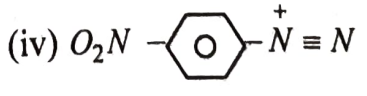
(4) 2-nitroquinoline

93. Arrange the following diazonium salts in order of increasing reactivity towards coupling reactions :

(i) 

(ii) 

(iii) 

(iv) 

(1) (i) < (ii) < (iii) < (iv)

(2) (ii) < (i) < (iii) < (iv)

(3) (iii) < (i) < (ii) < (iv)

(4) (iv) < (i) < (ii) < (iii)

94. When α-D-glucose (specific rotation +112°) and/or β-D-glucose (specific rotation +19°) are dissolved in water, a change in their specific rotation takes place till both attain a value of :

(1) +51.2°

(2) +57. 2°

(3) +55.7°

(4) +52.7°

95. On oxidation with conc. HNO_3, fructose give :

Select correct option from the following :

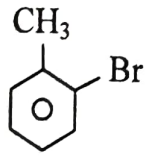
(1) Glutaric acid

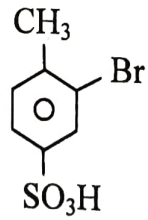
(2) Tartaric acid

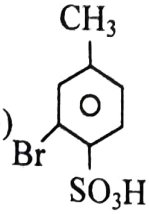
(3) Glycolic acid

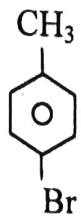
(4) A mixture of glutaric acid, tartaric acid and glycolic acid

96. Identify the product of monobromination of p-toluene sulphonic acid followed by treatment with acid and superheated steam :

(1) 

(2) 

(3) 

(4) 

97. Which one of the following statements is ***incorrect*** with regard to Ethyl aceto acetate.

(1) It behaves like a keto ester

(2) It reacts with hydrogen cyanide to form cyanohydrin

(3) It undergoes hydrolysis to form ketone

(4) It discolourises the ethanolic solution of bromine

98. A reaction between methyl magnesium bromide and ethylene oxide in presence of an acid results in the formation of :

(1) 2-propanol (2) 1-propanol

(3) propanal (4) Methoxy ethane

99. Which one of the following statements is ***not*** true for Ziegler-Natta polymerization :

(1) It is a co-ordination polymerization

(2) Polymerization takes place under relatively milder conditions

(3) Polymers obtained are not straight chain

(4) The polymerization takes place in stereospecific manner

100. Which one of the following amino acid is an example of neutral amino acid :

(1) Glutamic acid (2) Lysine

(3) Aspartic acid (4) Serine

Total No. of Printed Pages : 21

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B

SET-Y

PG-EE-2021

SUBJECT : Chemistry

10130

Sr. No. .....

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

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

Name_____Date of Birth_____

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 shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. 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. Silicones have the structural unit :

(1) $\left[\begin{array}{c} O \\ \| \\ -Si- \\ | \\ R \end{array}\right]$ (2) $\left[\begin{array}{c} R \\ | \\ -Si-O- \\ | \\ R \end{array}\right]$

(3) $\left[\begin{array}{c} R \\ | \\ -Si=O- \\ | \\ R \end{array}\right]$ (4) $\left[\begin{array}{cc} O & O \\ | & | \\ -Si- & Si- \\ | & | \\ R & R \end{array}\right]$

2. Which of the following is ***not*** a hard acid ?

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

(3) Pd^{2+} (4) Ti^{4+}

3. The term hard and soft acid and base was given by :

(1) Bronsted (2) Lewis

(3) Pearson (4) Franklin

4. Which of the following is ***not*** a protonic solvent ?

(1) HF (2) H_2O

(3) $CHCl_3$ (4) H_2SO_4

5. Which of the following does not belong to group III of basic radicals ?

(1) Al^{3+} (2) Cr^{3+}

(3) Bi^{3+} (4) Fe^{3+}

6. The colour of cus is :

(1) black (2) yellow

(3) blue (4) white

7. O_2 is bound to heme in a :

(1) bent way (2) linear arrangement

(3) Tetrahedral arrangement (4) Bridged way

8. The covalent character of alkali metal halides increases as (for some alkali metal) :

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

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

9. The peroxide of alkali metals contain an ion which is isoelectronic with :

(1) O_2 (2) O_2^-

(3) N_2 (4) F_2

10. Inorganic berzene in :

(1) (BN) (2) $B_3N_3H_6$

(3) B_6H_{10} (4) B_6H_{12}

11. Identify the ***incorrect*** statement from the following :

(1) Thiophene is more aromatic than furan

(2) Pyrrole is more basic than pyridine

(3) Furan is not stable to acid although it has aromatic character

(4) Pyridine is a weaker base than trimethyl amine

12. Which one is the major product obtained form nitration of quinoline with $(HNO_3 + H_2SO_4)$:

(1) 8-nitroquinoline
(2) 4-nitroquinoline
(3) 5-nitroquinoline
(4) 2-nitroquinoline

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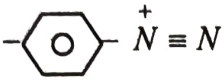
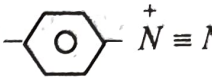
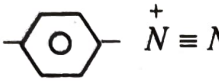
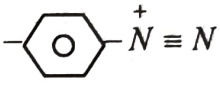
(i) $(CH_3)_2 - N -$  $\overset{+}{N} \equiv N$

(ii) $CH_3 - O -$  $\overset{+}{N} \equiv N$

(iii) CH_3  $\overset{+}{N} \equiv N$

(iv) O_2N  $\overset{+}{N} \equiv N$

(1) (i) < (ii) < (iii) < (iv)
(2) (ii) < (i) < (iii) < (iv)
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14. When α-D-glucose (specific rotation +112°) and/or β-D-glucose (specific rotation +19°) are dissolved in water, a change in their specific rotation takes place till both attain a value of :

(1) +51.2°
(2) +57. 2°
(3) +55.7°
(4) +52.7°

15. On oxidation with conc. HNO_3, fructose give :

Select correct option from the following :

(1) Glutaric acid
(2) Tartaric acid
(3) Glycolic acid
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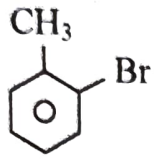
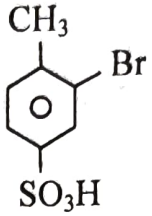
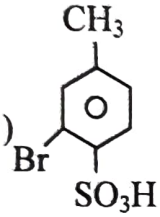
(1) 

(2) 

(3) 

(4) 

17. Which one of the following statements is ***incorrect*** with regard to Ethyl aceto acetate.

(1) It behaves like a keto ester

(2) It reacts with hydrogen cyanide to form cyanohydrin

(3) It undergoes hydrolysis to form ketone

(4) It discolourises the ethanolic solution of bromine

18. A reaction between methyl magnesium bromide and ethylene oxide in presence of an acid results in the formation of :

(1) 2-propanol

(2) 1-propanol

(3) propanal

(4) Methoxy ethane

19. Which one of the following statements is ***not*** true for Ziegler-Natta polymerization :

(1) It is a co-ordination polymerization

(2) Polymerization takes place under relatively milder conditions

(3) Polymers obtained are not straight chain

(4) The polymerization takes place in stereospecific manner

20. Which one of the following amino acid is an example of neutral amino acid :

(1) Glutamic acid (2) Lysine

(3) Aspartic acid (4) Serine

21. Identify the product of the following reaction.

$CH_3-CH_2-CH_2-CH_2-Cl+:\overset{\ominus}{C}\equiv CH \rightarrow ?$

(1) $CH_3-CH=CH-CH_2-C\equiv CH$

(2) $CH_3-CH_2-CH=CH-C\equiv CH$

(3) $HC\equiv C-CH_2-CH_2-CH_2-CH_3$

(4) $CH_2=CH-CH=CH-CH_2-CH_3$

22. In the reaction of $(CH_3)_3-C-Cl$ with strong base $\left(^-OH\right)$, the major product formed is :

(1) $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2$ (2) $HO-\underset{\underset{CH_3}{|}}{CH}-CH_3$

(3) $(CH_3)_3-C-OH$ (4) $HO-CH_2-\underset{\underset{CH_3}{|}}{C}=CH_2$

23. Arrange the following in increasing order of basicity : $H_2O, ^-OH, CH_3-OH$ and CH_3O^- :

(1) $H_2O<CH_3-OH<^-OH<CH_3O^-$

(2) $CH_3O^-<^-OH<CH_3-OH<H_2O$

(3) $CH_3O^-<CH_3-OH<^-OH<H_2O$

(4) $^-OH<H_2O<CH_3-OH<CH_3O^-$

24. Arrange following compounds in order of increasing acidity :-

cyclohexanole, phenol, p-bromophenol and p-methoxy phenol :

(1) Phenol < p-bromophenol < p-methoxy phenol < cyclohexanole

(2) p-methoxy phenol < phenol < p-bromophenol < cyclohexanole

(3) cyclohexanole < phenol < p-methoxy phenol < p-bromophenol

(4) cyclohexanole < p-methoxy phenol < phenol < p-bromophenol

25. What is the product formed when ethylane oxide reacts with phenyl magnesium bromide in presence of H^+ / H_2O using dry ether as solvent :

(1) 1-phenyl ethanol

(2) 2-phenyl ethanol

(3) Phenyl ethyl ether

(4) 2-ethyl phenol

26. What would be the product formed when calcium butanoate is heated along with calcium formate ?

(1) Butanal

(2) Butanoic acid

(3) Butan-i-ol

(4) Hept-4-one

27. o-methoxy toluene on nitration yields which of the following compound as main product :

(1) 2-methoxy-3-nitro toluene

(2) 2-methoxy-4-nitro toluene

(3) 2-methoxy-5-nitro toluene

(4) 2-methoxy-6-nitro toluene

28. An alkene having molecular formula C_6H_{12} on ozonolysis produces propanol as sole product identify the structure of given alkene from the following :

(1) $CH_3 - CH_2 - CH = CH - CH_2 - CH_3$

(2) $CH_3 - CH = CH - CH_2 - CH_2 - CH_3$

(3) $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$

(4) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH - CH_2 - CH_3$

29. An optically active compound, molecular formula $C_6H_{12}O$, reacts with 2, 4-dinitrophenyl hydrazine to give a red precipitate and also gives positive haloform test. Identify the structural formula of the compound from the following :

(1) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CO-CH_3$

(2) $CH_3-CH_2-CH_2-CO-CH_2-CH_3$

(3) $CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-COCH_3$

(4) $CH_3-CH_2-\overset{\overset{CH_3}{|}}{CH}-CO-CH_3$

30. Fermi resonance is often observed in I.R. spectra of :

(1) Aliphatic alkanes

(2) Alcohols

(3) Carbonyl compounds

(4) None of the above

31. Which of the following statements about a reaction occurring in galvanic cell is true :

(1) If $E^{\circ}_{cell} > 0$ $\Delta G < 0$

(2) If $E^{\circ}_{cell} < 0$ $\Delta G < 0$

(3) If $E^{\circ}_{cell} < 0$ $K_{eq} > 1$

(4) If $E^{\circ}_{cell} > 0$ $K_{eq} > 1$

32. Electrical potential of a cell is :

(1) An intensive property

(2) An extensive property

(3) An isothermal property

(4) An isobaric property

33. The Nernst distribution law $K_D = C_1/C_2$ is not applicable, if the solute undergoes :

(1) association in one of the solvents

(2) dissociation in one of the solvents

(3) association and dissociation in one of the solvents

(4) none of the above

34. Classical mechanics does not provide satisfactory explanation for the following :

(1) Black-body radiation

(2) Photoelectric effect

(3) Heat capacities of solids

(4) All of the above

35. Expression for a particle in one dimensional box is :

(1) $E = \frac{n^2h^2}{8ma^2}$

(2) $E = \frac{n^2h^2}{4ma^2}$

(3) $E = \frac{n^2h}{8ma^2}$

(4) $E = \frac{nh^2}{8ma^2}$

36. The substances which retain the magnetic field when removed from the magnetic field are called :

(1) paramagnetic

(2) diamagnetic

(3) ferrimagnetic

(4) ferromagnetic

37. Rotational spectra involve :

(1) a very high energy changes

(2) small energy changes

(3) no energy changes

(4) none of these

38. In the Raman spectrum middle line is called :

(1) Raman line

(2) Rayleigh line

(3) Functional group line

(4) none of these

39. The IR spectra of a compound helps in :

(1) providing the identity of compounds

(2) showing the presence of certain function groups in molecule

(3) neither of above

(4) both of the above

40. The electronic spectra consists of :

(1) a large number of absorption lines

(2) a large number of closely packed lines

(3) a large number of peaks

(4) none of these

41. The correct order of electronegativity is :

(1) $Cl > F > O > Br$

(2) $F > O > Cl > Br$

(3) $F > Cl > Br > O$

(4) $O > F > Cl > Br$

42. Find the molecule in which the central atom is having one lone pair of electrons :

(1) NH_3

(2) FCl_5

(3) H_2O

(4) CH_4

43. How many molecules are there in the unit cell of sodium chloride :

(1) 2

(2) 4

(3) 6

(4) 8

44. Which has maximum value of mean free path :

(1) CO_2 (2) H_2

(3) O_2 (4) N_2

45. For critical constants compression factor Z is :

(1) 1 (2) > 1

(3) < 1 (4) 0

46. The temperature at which a real gas obeys the ideal gas laws over a fairly wide range of pressure is :

(1) Critical temperature (2) Inversion temperature

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

47. If detergent is added :

(1) Surface tension decreases

(2) Surface tension increases

(3) Surface tension can decrease or increase

(4) no effect

48. A compound is formed by elements A & B and is cubic. A atoms are at the corners and B atoms are at the face centers. What is the formula ?

(1) AB (2) AB_2

(3) AB_3 (4) A_3B

49. A reaction takes place by following mechanism

$$A + BC \rightarrow AC + B$$

$$AC + D \rightarrow A + CD$$

Reactants are :

(1) A, BC

(2) BC, D

(3) AC, D

(4) A, BC, D

50. The rate of chemical reaction generally increases rapidly even for small temperature increase because of rapid increase in the :

(1) Fraction of molecules with energies in excess of activation energy

(2) Average kinetic energy of molecules

(3) Activation energy

(4) Collision frequency

51. Hydrazoic acid is :

(1) $H_4P_2O_7$

(2) HNO_4

(3) HN_3

(4) NH_3

52. Pyrosilicates contain the discrete silicate ion :

(1) $Si_2O_7^{6-}$

(2) $Si_3O_9^{6-}$

(3) $Si_6O_{18}^{12-}$

(4) $(SiO_3)_n^{2n-}$

53. The correct order of acidic strength in :

(1) $HClO > HIO > HBrO$

(2) $HIO > HBrO > HClO$

(3) $HClO > HBrO > HIO$

(4) $HBrO > HClO > HIO$

54. The shape of interhalogen ion, ICl_2^- is :

(1) Square planar

(2) Trigonal planar

(3) Linear

(4) Tetrahedral

55. Which noble gas forms maximum components ?

(1) Xenon

(2) Krypton

(3) Argon

(4) Helium

56. Hydrogen bonding is ***not*** present in :

(1) HF

(2) NH_3

(3) HCl

(4) H_2O

57. To prepare P-type semi-conductor, germanium may be doped with :

(1) P

(2) As

(3) In

(4) Sb

58. How many orbitals can have the following numbers, $n = 3$, $l = 1$, $m = 0$

(1) 4

(2) 2

(3) 1

(4) 3

59. 3P orbital has radial nodes :

(1) three

(2) two

(3) one

(4) none

60. The correct order for the size of I, I^+, I^- is :

(1) $I > I^- > I^+$

(2) $I > I^+ > I^-$

(3) $I^- > I > I^+$

(4) $I^+ > I^- > I$

61. Which has maximum value of $\wedge_{eq}$. at constant temperature assuming 100% ionization of each electrolyte :

(1) 0.1 M H_2SO_4

(2) 0.1 M H_3PO_3

(3) 0.1 M $H_2PO_4^-$

(4) equal

62. In the variation of $\wedge_m$ with $\sqrt{C}$, $\wedge_m = \wedge_m^\infty \left(A + B \wedge_m^\infty\right)\sqrt{C}$, A & B called :

(1) Vander Waal's constant

(2) Critical constants

(3) Onsagar constants

(4) Debye-Huckel constants

63. Specific conductance has unit :

(1) ohm-cm

(2) ohm $^{-1}$ cm

(3) ohm cm $^{-1}$

(4) ohm $^{-1}$ cm $^{-1}$

64. Which has the maximum internal energy :

(1) Helium gas

(2) Oxygen gas

(3) Ozone gas

(4) equal

65. Which is ***not*** a state function :

(1) q (2) H (3) E (4) G

66. Select the correct alternate about entropy :

(1) $\lim_{T\to\infty} S = 0$ (2) $\lim_{T\to 0} S = \infty$ (3) $\lim_{T\to 0} S = 0$ (4) $S_{(liquid)} > S_{(vapour)}$

67. When one mole of an ideal gas is compared to half its initial volume and simultaneously heated to twice its initial temperature, the change in entropy (ΔS) is :

(1) $C_v \ln 2$ (2) $C_p \ln 2$ (3) $R \ln 2$ (4) $(C_v - R) \ln 2$

68. $H_2O(g) \rightarrow H(g) + OH(g)\ \Delta H = x_1$

$OH(g) \rightarrow H(g) + O(g)\ \Delta H = x_2$

Based on these value bond energy of $O-H$ bond is :

(1) $x_1 + x_2$ (2) $\frac{x_1 + x_2}{2}$ (3) $\frac{x_1 - x_2}{2}$ (4) $2(x_1 + x_2)$

69. In the following equilibrium :

I $A + 2B \rightleftharpoons C, K_{eq} = K_1$

II $C + D \rightleftharpoons 3A\ K_{eq} = K_2$

III $6B + D \rightleftharpoons 2C\ K_{eq} = K_3$

hence :

(1) $3K_1 + K_2 = K_3$ (2) $K_1^3 + K_2^2 = K_3$

(3) $3K_1 + K_2^2 = K_3$ (4) $K_1^3 + K_2 = K_3$

70. Half cell reaction for a half-cell

$Hg(l) + 2OH^-(aq) \rightarrow HgO(S)H_2O(l) + 2e^-$

This half cell is reversible to :

(1) $H_2O(l)$ (2) $HgO(S)$

(3) $OH^-(aq)$ (4) All are correct

71. The light emitted in a chemiluminescent reaction is also called :

(1) Cold light (2) Hot light

(3) Bright light (4) None of these

72. Freezing point depression is measured by :

(1) Beckmann's method (2) Rast's camphor method

(3) Both (4) none of these

73. Which of the following is a colligative property :

(1) molar refractivity (2) optical rotation

(3) depression in freezing point (4) viscosity

74. The law of the relative lowering of vapour pressure was given by :

(1) Von't Hoff (2) Ostwald

(3) Raoult (4) Henery

75. In terms of Phases (P), Components (C) and Degree of Freedom (F), the phase rule is expressed as :

(1) P + F = C + 2 (2) P + C = F + 2

(3) F = P + C – 2 (4) P – F = C + 2

76. Lowest temperature is reached by using :

(1) $CaCl_2.H_2O$ (2) Acetone + dry ice

(3) NH_4Cl (4) Ether + dry ice

77. How many contributing structures are possible in hyperconjugation of toluene ?

(1) 06 (2) 09

(3) 15 (4) 03

78. The conjugation in an organic compound results in shift of U.V. absorption band towards :

(1) Low λ_{max} and low energy (2) High λ_{max} and high energy

(3) High λ_{max} and low energy (4) Low λ_{max} and high energy

79. In I. R. spectroscopy o-hydroxy benzoic acid and meta hydroxy benzoic acid can be differentiated on the basis of :

(1) C – O stretching frequency (2) O – H stretching frequency

(3) C – C stretching frequency (4) O – O stretching frequency

80. Which one of the following species behaves as nucleophile as well as electrophile ?

(1) $:\overset{\oplus}{\underset{\cdot\cdot}{Cl}}:$ (2) $CH_2 = CH_2$

(3) $(CH_3)_3 - C:$ (4) $H_3C \equiv N:$

81. d-block elements show all the following properties except :

(1) variable oxidation states (2) catalytic properties

(3) natural radioactivity (4) colour of the compounds

82. *Mo* and *W* belong to group of :

(1) Cu (2) Mn (3) Fe (4) Cr

83. The complexes $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are examples of :

(1) geometrical isomers

(2) co-ordination isomers

(3) linkage isomers

(4) position isomers

84. The number of unpaired electron in a d^7 tetrahedral configuration is :

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

85. In general, a metal complex is regarded as stable if its log β value is :

(1) Zero (2) less than 8 (3) more than 8 (4) 14

86. The spin only magnetic moment for Co^{2+} ion in :

(1) 4.90 B.M.

(2) 3.87 B.M.

(3) 2.84 B.M.

(4) 1.73 B.M.

87. For laporte forbidden transitions :

(1) $\Delta l = 0$

(2) $\Delta s = 0$

(3) $\Delta l = -1$

(4) $\Delta l = \pm 1$

88. Which of the following does not belong to lanthanides ?

(1) Nd

(2) Tm

(3) Cm

(4) Ce

89. The oxidation state of *U* in UO_2^{2+} is :

(1) 4

(2) 2

(3) 6

(4) 3

90. An example of olefin complex is :

(1) Ferrocene (2) Zeise salt

(3) Bis $\left(\eta^6 \text{ - benzene chromium}\right)$ (4) $(CO)_6\, CO_2 (Phc \equiv cPh)$

91. How many types of magnetically equivalent protons are present in $CH_3 - O - CH_2 - C - (CH_3)_3$:

(1) Five (2) Three (3) Fourteen (4) Two

92. The order of chemical shift values (δ) in $^1H - NMR$ for $CH_3F, CH_3 - Cl, CH_3 - Br, CH_3I$ and CH_3OH is :

(1) $CH_3OH > CH_3F > CH_3 - Cl > CH_3 - Br > CH_3I$

(2) $CH_3F > CH_3OH > CH_3 - Cl > CH_3 - Br > CH_3I$

(3) $CH_3I > CH_3 - Br > CH_3 - Cl > CH_3F > CH_3OH$

(4) $CH_3F > CH_3 - Cl > CH_3 - Br > CH_3I > CH_3OH$

93. The calculated peak value for λ_{max} in U.V. spectra for 2-methyl acetophenone is :

(1) 249 n.m. (2) 340 n.m.

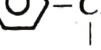
(3) 234 n.m. (4) 261 n.m.

94. Identify the product farmed by the reaction between nitromethane and benzaldehyde in presence of alcoholic KOH :

(1) $C_6H_5 - CH_2 - CH_2 - NO_2$ ( $- CH_2 - CH_2 - NO_2$)

(2) $C_6H_5 - \underset{\underset{NO_2}{|}}{CH} - CH_3$ ( $- \underset{\underset{NO_2}{|}}{CH} - CH_3$)

(3) $C_6H_5CH = CH - NO_2$ ( $- CH = CH - NO_2$)

(4) $C_6H_5 - \underset{\underset{NO_2}{|}}{CH} - CH_2 - NO_2$ ( $- \underset{\underset{NO_2}{|}}{CH} - CH_2 - NO_2$)

95. Select the correct increasing order of reactivity of the following carbonyl compounds in nucleophillic addition reactions :-

Benzaldehyde, p-tolualdehyde, p-nitrobenzaldehyde and acetophenone :

(1) Benzaldehyde < p–tolualdehyde < p-nitrobenzaldehyde < acetophenone.

(2) p-nitrobenzaldehyde < p-tolualdehyde < benzaldehyde < acetophenone

(3) Acetophenone < benzaldehyde < p-tolualdehyde < p-nitrobenzaldehyde

(4) Acetophenone < p-tolualdehyde < benzaldehyde < p-nitrobenzaldehyde

96. When p-methoxy benzaldehyde is treated with formaldehyde in presence of *NaOH*, the product formed is an alcohol alongwith sodium formate. Identify the type of reaction :

(1) Cannizzaro reaction

(2) Crossed cannizzaro reaction

(3) Intramolecular cannizzaro reaction

(4) Not a feasible reaction

97. Select the correct increasing order of basicity of the following compounds :-

Ethyl amine, pyrrole, pyridine and piperidine.

(1) Pyridine < pyrrole < piperidine < Ethyl amine

(2) Piperidine < pyridine < pyrrole < Ethyl amine

(3) Pyrrole < pyridine < piperidine < Ethyl amine

(4) Pyridine < piperidine < pyrrole < Ethyl amine

98. Which one of the following is ***not*** a correct statement for 'configurations' concept :

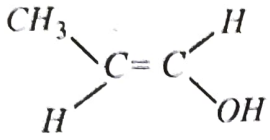
(1) 'Configurations' are three dimensional arrangements in space of the atoms in a molecule which are not interconvertible by rotation around a bond

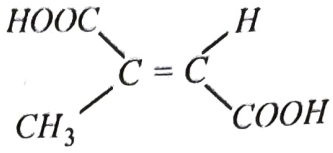
(2) The interconversion does not require breaking and making of bond

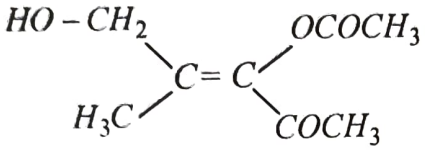
(3) The existence is involved in phenomena of geometrical and optical isomerism

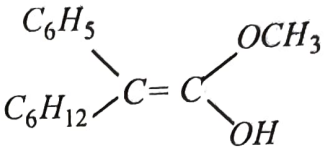
(4) Configurational isomers can exist as pure individual substance.

99. Designate the 'E' and 'Z' nomenclature to the following compounds and select the ***correct*** order from the options given below :

(i) 

(ii) 

(iii) 

(iv) 

(1) (i) E, (ii) Z, (iii) E, (iv) E

(2) (i) E, (ii) E, (iii) E, (iv) Z

(3) (i) Z, (ii) E, (iii) E, (iv) Z

(4) (i) Z, (ii) Z, (iii) E, (iv) E

100. Arrange the following alkanes in increasing order of their boiling points :-

Pentane, 2-methyl hexane, 2-methyl butane and heptane.

(1) Pantane < 2–methyl butane < 2-methyl hexane < heptane

(2) 2-methyl butane < 2-methyl hexane < pentane < heptane

(3) Heptane < pentane < 2-methyl hexane < 2-methyl butane

(4) 2-methyl butane < pentane < 2-methyl hexane < heptane

Total No. of Printed Pages : 21

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C

SET-Y

PG-EE-2021

SUBJECT : Chemistry

10039

Sr. No. .....

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

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

Name_____Date of Birth_____

Father's Name_____Mother's Name_____

Date of Examination_____

_____ _____

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

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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 shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. 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.*

SEAL

1. Which has maximum value of $\wedge_{eq}$ at constant temperature assuming 100% ionization of each electrolyte :

(1) 0.1 $M\ H_2SO_4$ (2) 0.1 $M\ H_3PO_3$

(3) 0.1 $M\ H_2PO_4^-$ (4) equal

2. In the variation of $\wedge_m$ with $\sqrt{C}$, $\wedge_m = \wedge_m^\infty \left(A + B \wedge_m^\infty\right)\sqrt{C}$, A & B called :

(1) Vander Waal's constant (2) Critical constants

(3) Onsagar constants (4) Debye-Huckel constants

3. Specific conductance has unit :

(1) ohm-cm (2) ohm $^{-1}$ cm

(3) ohm cm $^{-1}$ (4) ohm $^{-1}$ cm $^{-1}$

4. Which has the maximum internal energy :

(1) Helium gas (2) Oxygen gas

(3) Ozone gas (4) equal

5. Which is ***not*** a state function :

(1) q (2) H

(3) E (4) G

6. Select the correct alternate about entropy :

(1) $\lim_{T\to\infty} S = 0$ (2) $\lim_{T\to 0} S = \infty$

(3) $\lim_{T\to 0} S = 0$ (4) $S_{(liquid)} > S_{(vapour)}$

7. When one mole of an ideal gas is compared to half its initial volume and simultaneously heated to twice its initial temperature, the change in entropy (ΔS) is :

(1) $C_v \, ln\, 2$

(2) $C_p \, ln\, 2$

(3) $R \, ln\, 2$

(4) $(C_v - R) \, ln\, 2$

8. $H_2O(g) \rightarrow H(g) + OH(g) \;\; \Delta H = x_1$

$OH(g) \rightarrow H(g) + O(g) \;\; \Delta H = x_2$

Based on these value bond energy of $O - H$ bond is :

(1) $x_1 + x_2$

(2) $\frac{x_1 + x_2}{2}$

(3) $\frac{x_1 - x_2}{2}$

(4) $2(x_1 + x_2)$

9. In the following equilibrium :

I $A + 2B \rightleftharpoons C, K_{eq} = K_1$

II $C + D \rightleftharpoons 3A \;\; K_{eq} = K_2$

III $6B + D \rightleftharpoons 2C \;\; K_{eq} = K_3$

hence :

(1) $3K_1 + K_2 = K_3$

(2) $K_1^3 + K_2^2 = K_3$

(3) $3K_1 + K_2^2 = K_3$

(4) $K_1^3 + K_2 = K_3$

10. Half cell reaction for a half-cell

$Hg(l) + 2OH^-(aq) \rightarrow HgO(S)H_2O(l) + 2e^-$

This half cell is reversible to :

(1) $H_2O(l)$

(2) $HgO(S)$

(3) $OH^-(aq)$

(4) All are correct

11. Hydrazoic acid is :

(1) $H_4P_2O_7$ (2) HNO_4

(3) HN_3 (4) NH_3

12. Pyrosilicates contain the discrete silicate ion :

(1) $Si_2O_7^{6-}$ (2) $Si_3O_9^{6-}$

(3) $Si_6O_{18}^{12-}$ (4) $(SiO_3)_n^{2n-}$

13. The correct order of acidic strength in :

(1) $HClO > HIO > HBrO$ (2) $HIO > HBrO > HClO$

(3) $HClO > HBrO > HIO$ (4) $HBrO > HClO > HIO$

14. The shape of interhalogen ion, ICl_2^- is :

(1) Square planar (2) Trigonal planar

(3) Linear (4) Tetrahedral

15. Which noble gas forms maximum components ?

(1) Xenon (2) Krypton

(3) Argon (4) Helium

16. Hydrogen bonding is ***not*** present in :

(1) HF (2) NH_3

(3) HCl (4) H_2O

17. To prepare P-type semi-conductor, germanium may be doped with :

(1) P (2) As

(3) In (4) Sb

18. How many orbitals can have the following numbers, $n = 3$, $l = 1$, $m = 0$

(1) 4 (2) 2

(3) 1 (4) 3

19. 3P orbital has radial nodes :

(1) three (2) two

(3) one (4) none

20. The correct order for the size of I, I^+, I^- is :

(1) $I > I^- > I^+$ (2) $I > I^+ > I^-$

(3) $I^- > I > I^+$ (4) $I^+ > I^- > I$

21. d-block elements show all the following properties except :

(1) variable oxidation states (2) catalytic properties

(3) natural radioactivity (4) colour of the compounds

22. *Mo* and *W* belong to group of :

(1) Cu (2) Mn

(3) Fe (4) Cr

23. The complexes $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are examples of :

(1) geometrical isomers (2) co-ordination isomers

(3) linkage isomers (4) position isomers

24. The number of unpaired electron in a d^7 tetrahedral configuration is :

(1) 3 (2) 2

(3) 1 (4) 7

25. In general, a metal complex is regarded as stable if its log β value is :

(1) Zero (2) less than 8

(3) more than 8 (4) 14

26. The spin only magnetic moment for Co^{2+} ion in :

(1) 4.90 B.M. (2) 3.87 B.M.

(3) 2.84 B.M. (4) 1.73 B.M.

27. For laporte forbidden transitions :

(1) $\Delta l = 0$ (2) $\Delta s = 0$

(3) $\Delta l = -1$ (4) $\Delta l = \pm 1$

28. Which of the following does not belong to lanthanides ?

(1) Nd (2) Tm

(3) Cm (4) Ce

29. The oxidation state of U in UO_2^{2+} is :

(1) 4 (2) 2

(3) 6 (4) 3

30. An example of olefin complex is :

(1) Ferrocene (2) Zeise salt

(3) Bis $(\eta^6$ - benzene chromium$)$ (4) $(CO)_6\, CO_2 (Phc \equiv cPh)$

31. Identify the ***incorrect*** statement from the following :

(1) Thiophene is more aromatic than furan

(2) Pyrrole is more basic than pyridine

(3) Furan is not stable to acid although it has aromatic character

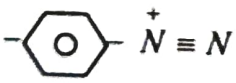
(4) Pyridine is a weaker base than trimethyl amine

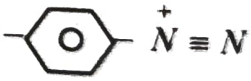
32. Which one is the major product obtained form nitration of quinoline with $(HNO_3 + H_2SO_4)$:

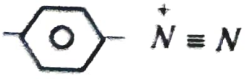
(1) 8-nitroquinoline (2) 4-nitroquinoline

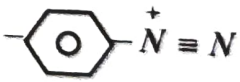
(3) 5-nitroquinoline (4) 2-nitroquinoline

33. Arrange the following diazonium salts in order of increasing reactivity towards coupling reactions :

(i) $(CH_3)_2 - N$  $\overset{+}{N} \equiv N$

(ii) $CH_3 - O$  $\overset{+}{N} \equiv N$

(iii) CH_3  $\overset{+}{N} \equiv N$

(iv) O_2N  $\overset{+}{N} \equiv N$

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

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

34. When α-D-glucose (specific rotation +112°) and/or β-D-glucose (specific rotation +19°) are dissolved in water, a change in their specific rotation takes place till both attain a value of :

(1) +51.2° (2) +57. 2° (3) +55.7° (4) +52.7°

35. On oxidation with conc. HNO_3, fructose give :

Select correct option from the following :

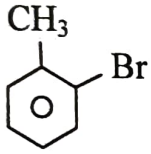
(1) Glutaric acid

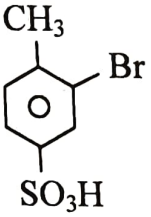
(2) Tartaric acid

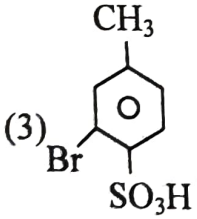
(3) Glycolic acid

(4) A mixture of glutaric acid, tartaric acid and glycolic acid

36. Identify the product of monobromination of p-toluene sulphonic acid followed by treatment with acid and superheated steam :

(1) 

(2) 

(3) 

(4) 

37. Which one of the following statements is ***incorrect*** with regard to Ethyl aceto acetate.

(1) It behaves like a keto ester

(2) It reacts with hydrogen cyanide to form cyanohydrin

(3) It undergoes hydrolysis to form ketone

(4) It discolourises the ethanolic solution of bromine

38. A reaction between methyl magnesium bromide and ethylene oxide in presence of an acid results in the formation of :

(1) 2-propanol (2) 1-propanol

(3) propanal (4) Methoxy ethane

39. Which one of the following statements is ***not*** true for Ziegler-Natta polymerization :

(1) It is a co-ordination polymerization

(2) Polymerization takes place under relatively milder conditions

(3) Polymers obtained are not straight chain

(4) The polymerization takes place in stereospecific manner

40. Which one of the following amino acid is an example of neutral amino acid :

(1) Glutamic acid (2) Lysine

(3) Aspartic acid (4) Serine

41. The light emitted in a chemiluminescent reaction is also called :

(1) Cold light (2) Hot light

(3) Bright light (4) None of these

42. Freezing point depression is measured by :

(1) Beckmann's method (2) Rast's camphor method

(3) Both (4) none of these

43. Which of the following is a colligative property :

(1) molar refractivity (2) optical rotation

(3) depression in freezing point (4) viscosity

44. The law of the relative lowering of vapour pressure was given by :

(1) Von't Hoff (2) Ostwald

(3) Raoult (4) Henery

45. In terms of Phases (P), Components (C) and Degree of Freedom (F), the phase rule is expressed as :

(1) $P + F = C + 2$ (2) $P + C = F + 2$

(3) $F = P + C - 2$ (4) $P - F = C + 2$

46. Lowest temperature is reached by using :

(1) $CaCl_2.H_2O$ (2) Acetone + dry ice

(3) NH_4Cl (4) Ether + dry ice

47. How many contributing structures are possible in hyperconjugation of toluene ?

(1) 06 (2) 09

(3) 15 (4) 03

48. The conjugation in an organic compound results in shift of U.V. absorption band towards :

(1) Low λ_{max} and low energy (2) High λ_{max} and high energy

(3) High λ_{max} and low energy (4) Low λ_{max} and high energy

49. In I. R. spectroscopy o-hydroxy benzoic acid and meta hydroxy benzoic acid can be differentiated on the basis of :

(1) C – O stretching frequency (2) O – H stretching frequency

(3) C – C stretching frequency (4) O – O stretching frequency

50. Which one of the following species behaves as nucleophile as well as electrophile ?

(1) $:\overset{\oplus}{C}l:$ (2) $CH_2 = CH_2$

(3) $(CH_3)_3 - C:$ (4) $H_3C \equiv N:$

51. The correct order of electronegativity is :

(1) $Cl > F > O > Br$ (2) $F > O > Cl > Br$

(3) $F > Cl > Br > O$ (4) $O > F > Cl > Br$

52. Find the molecule in which the central atom is having one lone pair of electrons :

(1) NH_3 (2) FCl_5

(3) H_2O (4) CH_4

53. How many molecules are there in the unit cell of sodium chloride :

(1) 2 (2) 4

(3) 6 (4) 8

54. Which has maximum value of mean free path :

(1) CO_2 (2) H_2

(3) O_2 (4) N_2

55. For critical constants compression factor Z is :

(1) 1 (2) > 1

(3) < 1 (4) 0

56. The temperature at which a real gas obeys the ideal gas laws over a fairly wide range of pressure is :

(1) Critical temperature

(2) Inversion temperature

(3) Boyle's temperature

(4) Reduced temperature

57. If detergent is added :

(1) Surface tension decreases

(2) Surface tension increases

(3) Surface tension can decrease or increase

(4) no effect

58. A compound is formed by elements A & B and is cubic. A atoms are at the corners and B atoms are at the face centers. What is the formula ?

(1) AB

(2) AB_2

(3) AB_3

(4) A_3B

59. A reaction takes place by following mechanism

$$A + BC \rightarrow AC + B$$

$$AC + D \rightarrow A + CD$$

Reactants are :

(1) A, BC

(2) BC, D

(3) AC, D

(4) A, BC, D

60. The rate of chemical reaction generally increases rapidly even for small temperature increase because of rapid increase in the :

(1) Fraction of molecules with energies in excess of activation energy

(2) Average kinetic energy of molecules

(3) Activation energy

(4) Collision frequency

61. Identify the product of the following reaction.

$$CH_3-CH_2-CH_2-CH_2-Cl+:\overset{\ominus}{C}\equiv CH \rightarrow \ ?$$

(1) $CH_3-CH=CH-CH_2-C\equiv CH$ (2) $CH_3-CH_2-CH=CH-C\equiv CH$

(3) $HC\equiv C-CH_2-CH_2-CH_2-CH_3$ (4) $CH_2=CH-CH=CH-CH_2-CH_3$

62. In the reaction of $(CH_3)_3-C-Cl$ with strong base $\left(^-OH\right)$, the major product formed is :

(1) $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2$ (2) $HO-\underset{\underset{CH_3}{|}}{CH}-CH_3$

(3) $(CH_3)_3-C-OH$ (4) $HO-CH_2-\underset{\underset{CH_3}{|}}{C}=CH_2$

63. Arrange the following in increasing order of basicity : $H_2O, {}^-OH, CH_3-OH$ and CH_3O^- :

(1) $H_2O<CH_3-OH<{}^-OH<CH_3O^-$ (2) $CH_3O^-<{}^-OH<CH_3-OH<H_2O$

(3) $CH_3O^-<CH_3-OH<{}^-OH<H_2O$ (4) $^-OH<H_2O<CH_3-OH<CH_3O^-$

64. Arrange following compounds in order of increasing acidity :-

cyclohexanole, phenol, p-bromophenol and p-methoxy phenol :

(1) Phenol < p-bromophenol < p-methoxy phenol < cyclohexanole

(2) p-methoxy phenol < phenol < p-bromophenol < cyclohexanole

(3) cyclohexanole < phenol < p-methoxy phenol < p-bromophenol

(4) cyclohexanole < p-methoxy phenol < phenol < p-bromophenol

65. What is the product formed when ethylane oxide reacts with phenyl magnesium bromide in presence of H^+ / H_2O using dry ether as solvent :

(1) 1-phenyl ethanol

(2) 2-phenyl ethanol

(3) Phenyl ethyl ether

(4) 2-ethyl phenol

66. What would be the product formed when calcium butanoate is heated along with calcium formate ?

(1) Butanal

(2) Butanoic acid

(3) Butan-i-ol

(4) Hept-4-one

67. o-methoxy toluene on nitration yields which of the following compound as main product :

(1) 2-methoxy-3-nitro toluene

(2) 2-methoxy-4-nitro toluene

(3) 2-methoxy-5-nitro toluene

(4) 2-methoxy-6-nitro toluene

68. An alkene having molecular formula C_6H_{12} on ozonolysis produces propanol as sole product identify the structure of given alkene from the following :

(1) $CH_3 - CH_2 - CH = CH - CH_2 - CH_3$

(2) $CH_3 - CH = CH - CH_2 - CH_2 - CH_3$

(3) $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$

(4) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}} = CH - CH_2 - CH_3$

69. An optically active compound, molecular formula $C_6H_{12}O$, reacts with 2, 4-dinitrophenyl hydrazine to give a red precipitate and also gives positive haloform test. Identify the structural formula of the compound from the following :

(1) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CO-CH_3$

(2) $CH_3-CH_2-CH_2-CO-CH_2-CH_3$

(3) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-COCH_3$

(4) $CH_3-CH_2-\overset{\displaystyle CH_3}{\overset{|}{CH}}-CO-CH_3$

70. Fermi resonance is often observed in I.R. spectra of :

(1) Aliphatic alkanes

(2) Alcohols

(3) Carbonyl compounds

(4) None of the above

71. How many types of magnetically equivalent protons are present in $CH_3-O-CH_2-C-(CH_3)_3$:

(1) Five

(2) Three

(3) Fourteen

(4) Two

72. The order of chemical shift values (δ) in ^1H-NMR for $CH_3F, CH_3-Cl, CH_3-Br, CH_3I$ and CH_3OH is :

(1) $CH_3OH > CH_3F > CH_3-Cl > CH_3-Br > CH_3I$

(2) $CH_3F > CH_3OH > CH_3-Cl > CH_3-Br > CH_3I$

(3) $CH_3I > CH_3-Br > CH_3-Cl > CH_3F > CH_3OH$

(4) $CH_3F > CH_3-Cl > CH_3-Br > CH_3I > CH_3OH$

73. The calculated peak value for λ_{max} in U.V. spectra for 2-methyl acetophenone is :

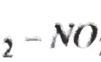
(1) 249 n.m.

(2) 340 n.m.

(3) 234 n.m.

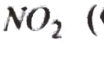
(4) 261 n.m.

74. Identify the product farmed by the reaction between nitromethane and benzaldehyde in presence of alcoholic KOH :

(1) $C_6H_5-CH_2-CH_2-NO_2$ ()

(2) $C_6H_5-\underset{\underset{NO_2}{|}}{CH}-CH_3$ ()

(3) $C_6H_5CH=CH-NO_2$ ( )

(4) $C_6H_5-\underset{\underset{NO_2}{|}}{CH}-CH_2-NO_2$ ()

75. Select the correct increasing order of reactivity of the following carbonyl compounds in nucleophillic addition reactions :-

Benzaldehyde, p-tolualdehyde, p-nitrobenzaldehyde and acetophenone :

(1) Benzaldehyde < p–tolualdehyde < p-nitrobenzaldehyde < acetophenone.

(2) p-nitrobenzaldehyde < p-tolualdehyde < benzaldehyde < acetophenone

(3) Acetophenone < benzaldehyde < p-tolualdehyde < p-nitrobenzaldehyde

(4) Acetophenone < p-tolualdehyde < benzaldehyde < p-nitrobenzaldehyde

76. When p-methoxy benzaldehyde is treated with formaldehyde in presence of $NaOH$, the product formed is an alcohol alongwith sodium formate. Identify the type of reaction :

(1) Cannizzaro reaction (2) Crossed cannizzaro reaction

(3) Intramolecular cannizzaro reaction (4) Not a feasible reaction

77. Select the correct increasing order of basicity of the following compounds :-

Ethyl amine, pyrrole, pyridine and piperidine.

(1) Pyridine < pyrrole < piperidine < Ethyl amine

(2) Piperidine < pyridine < pyrrole < Ethyl amine

(3) Pyrrole < pyridine < piperidine < Ethyl amine

(4) Pyridine < piperidine < pyrrole < Ethyl amine

78. Which one of the following is ***not*** a correct statement for 'configurations' concept :

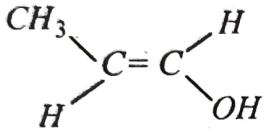
(1) 'Configurations' are three dimensional arrangements in space of the atoms in a molecule which are not interconvertible by rotation around a bond

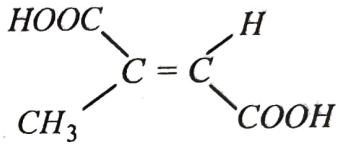
(2) The interconversion does not require breaking and making of bond

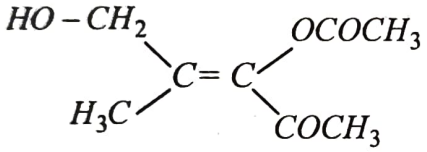
(3) The existence is involved in phenomena of geometrical and optical isomerism

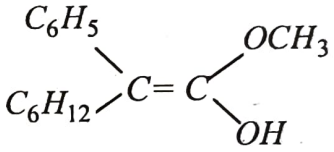
(4) Configurational isomers can exist as pure individual substance.

79. Designate the 'E' and 'Z' nomenclature to the following compounds and select the ***correct*** order from the options given below :

(i) 

(ii) 

(iii) 

(iv) 

(1) (i) E, (ii) Z, (iii) E, (iv) E

(2) (i) E, (ii) E, (iii) E, (iv) Z

(3) (i) Z, (ii) E, (iii) E, (iv) Z

(4) (i) Z, (ii) Z, (iii) E, (iv) E

80. Arrange the following alkanes in increasing order of their boiling points :-

Pentane, 2-methyl hexane, 2-methyl butane and heptane.

(1) Pantane < 2–methyl butane < 2-methyl hexane < heptane

(2) 2-methyl butane < 2-methyl hexane < pentane < heptane

(3) Heptane < pentane < 2-methyl hexane < 2-methyl butane

(4) 2-methyl butane < pentane < 2-methyl hexane < heptane

81. Silicones have the structural unit :

(1) $\left[- \underset{\underset{R}{|}}{\overset{\overset{O}{||}}{Si}} - \right]$

(2) $\left[- \underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}} - O - \right]$

(3) $\left[- \underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}} = O - \right]$

(4) $\left[- \underset{\underset{R}{|}}{\overset{\overset{O}{|}}{Si}} - \underset{\underset{R}{|}}{\overset{\overset{O}{|}}{Si}} - \right]$

82. Which of the following is ***not*** a hard acid ?

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

(3) Pd^{2+} (4) Ti^{4+}

83. The term hard and soft acid and base was given by :

(1) Bronsted (2) Lewis

(3) Pearson (4) Franklin

84. Which of the following is ***not*** a protonic solvent ?

(1) HF (2) H_2O

(3) $CHCl_3$ (4) H_2SO_4

85. Which of the following does not belong to group III of basic radicals ?

(1) Al^{3+} (2) Cr^{3+}

(3) Bi^{3+} (4) Fe^{3+}

86. The colour of cus is :

(1) black (2) yellow

(3) blue (4) white

87. O_2 is bound to heme in a :

(1) bent way (2) linear arrangement

(3) Tetrahedral arrangement (4) Bridged way

88. The covalent character of alkali metal halides increases as (for some alkali metal) :

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

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

89. The peroxide of alkali metals contain an ion which is isoelectronic with :

(1) O_2 (2) O_2^-

(3) N_2 (4) F_2

90. Inorganic berzene in :

(1) (BN) (2) $B_3N_3H_6$

(3) B_6H_{10} (4) B_6H_{12}

91. Which of the following statements about a reaction occurring in galvanic cell is true :

(1) If $E^\circ_{cell} > 0$ $\Delta G < 0$ (2) If $E^\circ_{cell} < 0$ $\Delta G < 0$

(3) If $E^\circ_{cell} < 0$ $K_{eq} > 1$ (4) If $E^\circ_{cell} > 0$ $K_{eq} > 1$

92. Electrical potential of a cell is :

(1) An intensive property

(2) An extensive property

(3) An isothermal property

(4) An isobaric property

93. The Nernst distribution law $K_D = {}^{C_1}/_{C_2}$ is not applicable, if the solute undergoes :

(1) association in one of the solvents

(2) dissociation in one of the solvents

(3) association and dissociation in one of the solvents

(4) none of the above

94. Classical mechanics does not provide satisfactory explanation for the following :

(1) Black-body radiation (2) Photoelectric effect

(3) Heat capacities of solids (4) All of the above

95. Expression for a particle in one dimensional box is :

(1) $E = \frac{n^2h^2}{8ma^2}$ (2) $E = \frac{n^2h^2}{4ma^2}$

(3) $E = \frac{n^2h}{8ma^2}$ (4) $E = \frac{nh^2}{8ma^2}$

96. The substances which retain the magnetic field when removed from the magnetic field are called :

(1) paramagnetic (2) diamagnetic

(3) ferrimagnetic (4) ferromagnetic

97. Rotational spectra involve :

(1) a very high energy changes

(2) small energy changes

(3) no energy changes

(4) none of these

98. In the Raman spectrum middle line is called :

(1) Raman line

(2) Rayleigh line

(3) Functional group line

(4) none of these

99. The IR spectra of a compound helps in :

(1) providing the identity of compounds

(2) showing the presence of certain function groups in molecule

(3) neither of above

(4) both of the above

100. The electronic spectra consists of :

(1) a large number of absorption lines

(2) a large number of closely packed lines

(3) a large number of peaks

(4) none of these

Total No. of Printed Pages : 21

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D

SET-Y

PG-EE-2021

SUBJECT : Chemistry

Sr. No. 10044

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

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

Name_____ Date of Birth_____

Father's Name_____ Mother's Name_____

Date of Examination_____

_____ _____

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

SEAL

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 shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. 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 product of the following reaction.

$CH_3-CH_2-CH_2-CH_2-Cl + :\overset{\ominus}{C}\equiv CH \rightarrow ?$

(1) $CH_3-CH=CH-CH_2-C\equiv CH$ (2) $CH_3-CH_2-CH=CH-C\equiv CH$

(3) $HC\equiv C-CH_2-CH_2-CH_2-CH_3$ (4) $CH_2=CH-CH=CH-CH_2-CH_3$

2. In the reaction of $(CH_3)_3-C-Cl$ with strong base $\left(^-OH\right)$, the major product formed is :

(1) $CH_3-\underset{\underset{CH_3}{|}}{C}=CH_2$ (2) $HO-\underset{\underset{CH_3}{|}}{CH}-CH_3$

(3) $(CH_3)_3-C-OH$ (4) $HO-CH_2-\underset{\underset{CH_3}{|}}{C}=CH_2$

3. Arrange the following in increasing order of basicity : $H_2O, ^-OH, CH_3-OH$ and CH_3O^- :

(1) $H_2O < CH_3-OH < ^-OH < CH_3O^-$ (2) $CH_3O^- < ^-OH < CH_3-OH < H_2O$

(3) $CH_3O^- < CH_3-OH < ^-OH < H_2O$ (4) $^-OH < H_2O < CH_3-OH < CH_3O^-$

4. Arrange following compounds in order of increasing acidity :-

cyclohexanole, phenol, p-bromophenol and p-methoxy phenol :

(1) Phenol < p-bromophenol < p-methoxy phenol < cyclohexanole

(2) p-methoxy phenol < phenol < p-bromophenol < cyclohexanole

(3) cyclohexanole < phenol < p-methoxy phenol < p-bromophenol

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5. What is the product formed when ethylane oxide reacts with phenyl magnesium bromide in presence of H^+ / H_2O using dry ether as solvent :

(1) 1-phenyl ethanol
(2) 2-phenyl ethanol
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6. What would be the product formed when calcium butanoate is heated along with calcium formate ?

(1) Butanal
(2) Butanoic acid
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7. o-methoxy toluene on nitration yields which of the following compound as main product :

(1) 2-methoxy-3-nitro toluene
(2) 2-methoxy-4-nitro toluene
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(4) 2-methoxy-6-nitro toluene

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(2) $CH_3 - CH = CH - CH_2 - CH_2 - CH_3$
(3) $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$
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(1) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - CH_2 - CO - CH_3$
(2) $CH_3 - CH_2 - CH_2 - CO - CH_2 - CH_3$
(3) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{\displaystyle |}{\underset{\displaystyle |}{C}}}} - COCH_3$
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(3) Carbonyl compounds

(4) None of the above

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(2) If $E^{\circ}_{cell} < 0$ $\Delta G < 0$

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20. The electronic spectra consists of :

(1) a large number of absorption lines (2) a large number of closely packed lines

(3) a large number of peaks (4) none of these

21. The correct order of electronegativity is :

(1) $Cl > F > O > Br$ (2) $F > O > Cl > Br$

(3) $F > Cl > Br > O$ (4) $O > F > Cl > Br$

22. Find the molecule in which the central atom is having one lone pair of electrons :

(1) NH_3 (2) FCl_5

(3) H_2O (4) CH_4

23. How many molecules are there in the unit cell of sodium chloride :

(1) 2 (2) 4

(3) 6 (4) 8

24. Which has maximum value of mean free path :

(1) CO_2 (2) H_2

(3) O_2 (4) N_2

25. For critical constants compression factor Z is :

(1) 1 (2) > 1

(3) < 1 (4) 0

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$$AC + D \rightarrow A + CD$$

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40. Inorganic berzene in :

(1) (BN) (2) $B_3N_3H_6$ (3) B_6H_{10} (4) B_6H_{12}

41. Identify the ***incorrect*** statement from the following :

(1) Thiophene is more aromatic than furan

(2) Pyrrole is more basic than pyridine

(3) Furan is not stable to acid although it has aromatic character

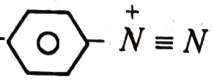
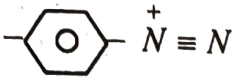
(4) Pyridine is a weaker base than trimethyl amine

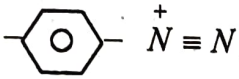
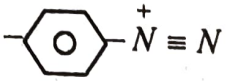
42. Which one is the major product obtained form nitration of quinoline with $(HNO_3 + H_2SO_4)$:

(1) 8-nitroquinoline (2) 4-nitroquinoline

(3) 5-nitroquinoline (4) 2-nitroquinoline

43. Arrange the following diazonium salts in order of increasing reactivity towards coupling reactions :

(i) $(CH_3)_2 - N -$  (ii) $CH_3 - O -$ 

(iii) $CH_3 -$  (iv) $O_2N -$ 

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

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

44. When α-D-glucose (specific rotation +112°) and/or β-D-glucose (specific rotation +19°) are dissolved in water, a change in their specific rotation takes place till both attain a value of :

(1) +51.2° (2) +57. 2° (3) +55.7° (4) +52.7°

45. On oxidation with conc. HNO_3, fructose give :

Select correct option from the following :

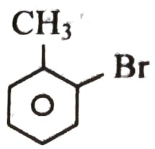
(1) Glutaric acid

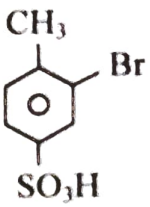
(2) Tartaric acid

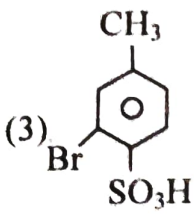
(3) Glycolic acid

(4) A mixture of glutaric acid, tartaric acid and glycolic acid

46. Identify the product of monobromination of p-toluene sulphonic acid followed by treatment with acid and superheated steam :

(1) 

(2) 

(3) 

(4) 

47. Which one of the following statements is ***incorrect*** with regard to Ethyl aceto acetate.

(1) It behaves like a keto ester

(2) It reacts with hydrogen cyanide to form cyanohydrin

(3) It undergoes hydrolysis to form ketone

(4) It discolourises the ethanolic solution of bromine

48. A reaction between methyl magnesium bromide and ethylene oxide in presence of an acid results in the formation of :

(1) 2-propanol (2) 1-propanol

(3) propanal (4) Methoxy ethane

49. Which one of the following statements is ***not*** true for Ziegler-Natta polymerization :

(1) It is a co-ordination polymerization

(2) Polymerization takes place under relatively milder conditions

(3) Polymers obtained are not straight chain

(4) The polymerization takes place in stereospecific manner

50. Which one of the following amino acid is an example of neutral amino acid :

(1) Glutamic acid (2) Lysine

(3) Aspartic acid (4) Serine

51. The light emitted in a chemiluminescent reaction is also called :

(1) Cold light (2) Hot light

(3) Bright light (4) None of these

52. Freezing point depression is measured by :

(1) Beckmann's method (2) Rast's camphor method

(3) Both (4) none of these

53. Which of the following is a colligative property :

(1) molar refractivity (2) optical rotation

(3) depression in freezing point (4) viscosity

54. The law of the relative lowering of vapour pressure was given by :

(1) Von't Hoff

(2) Ostwald

(3) Raoult

(4) Henery

55. In terms of Phases (P), Components (C) and Degree of Freedom (F), the phase rule is expressed as :

(1) $P + F = C + 2$

(2) $P + C = F + 2$

(3) $F = P + C - 2$

(4) $P - F = C + 2$

56. Lowest temperature is reached by using :

(1) $CaCl_2.H_2O$

(2) Acetone + dry ice

(3) NH_4Cl

(4) Ether + dry ice

57. How many contributing structures are possible in hyperconjugation of toluene ?

(1) 06 (2) 09 (3) 15 (4) 03

58. The conjugation in an organic compound results in shift of U.V. absorption band towards :

(1) Low λ_{max} and low energy

(2) High λ_{max} and high energy

(3) High λ_{max} and low energy

(4) Low λ_{max} and high energy

59. In I. R. spectroscopy o-hydroxy benzoic acid and meta hydroxy benzoic acid can be differentiated on the basis of :

(1) C – O stretching frequency

(2) O – H stretching frequency

(3) C – C stretching frequency

(4) O – O stretching frequency

60. Which one of the following species behaves as nucleophile as well as electrophile ?

(1) $:\overset{\oplus}{C}l:$ (2) $CH_2 = CH_2$

(3) $(CH_3)_3 - C:$ (4) $H_3C \equiv N:$

61. How many types of magnetically equivalent protons are present in $CH_3 - O - CH_2 - C - (CH_3)_3$:

(1) Five (2) Three (3) Fourteen (4) Two

62. The order of chemical shift values (δ) in $^1H - NMR$ for $CH_3F, CH_3 - Cl, CH_3 - Br, CH_3I$ and CH_3OH is :

(1) $CH_3OH > CH_3F > CH_3 - Cl > CH_3 - Br > CH_3I$

(2) $CH_3F > CH_3OH > CH_3 - Cl > CH_3 - Br > CH_3I$

(3) $CH_3I > CH_3 - Br > CH_3 - Cl > CH_3F > CH_3OH$

(4) $CH_3F > CH_3 - Cl > CH_3 - Br > CH_3I > CH_3OH$

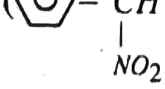
63. The calculated peak value for λ_{max} in U.V. spectra for 2-methyl acetophenone is :

(1) 249 n.m. (2) 340 n.m.

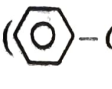
(3) 234 n.m. (4) 261 n.m.

64. Identify the product farmed by the reaction between nitromethane and benzaldehyde in presence of alcoholic *KOH* :

(1) $C_6H_5 - CH_2 - CH_2 - NO_2$ ( )

(2) $C_6H_5 - \underset{\underset{NO_2}{|}}{CH} - CH_3$ ()

(3) $C_6H_5CH = CH - NO_2$ ()

(4) $C_6H_5 - \underset{\underset{NO_2}{|}}{CH} - CH_2 - NO_2$ ()

65. Select the correct increasing order of reactivity of the following carbonyl compounds in nucleophillic addition reactions :-

Benzaldehyde, p-tolualdehyde, p-nitrobenzaldehyde and acetophenone :

(1) Benzaldehyde < p–tolualdehyde < p-nitrobenzaldehyde < acetophenone.

(2) p-nitrobenzaldehyde < p-tolualdehyde < benzaldehyde < acetophenone

(3) Acetophenone < benzaldehyde < p-tolualdehyde < p-nitrobenzaldehyde

(4) Acetophenone < p-tolualdehyde < benzaldehyde < p-nitrobenzaldehyde

66. When p-methoxy benzaldehyde is treated with formaldehyde in presence of *NaOH*, the product formed is an alcohol alongwith sodium formate. Identify the type of reaction :

(1) Cannizzaro reaction

(2) Crossed cannizzaro reaction

(3) Intramolecular cannizzaro reaction

(4) Not a feasible reaction

67. Select the correct increasing order of basicity of the following compounds :-

Ethyl amine, pyrrole, pyridine and piperidine.

(1) Pyridine < pyrrole < piperidine < Ethyl amine

(2) Piperidine < pyridine < pyrrole < Ethyl amine

(3) Pyrrole < pyridine < piperidine < Ethyl amine

(4) Pyridine < piperidine < pyrrole < Ethyl amine

68. Which one of the following is ***not*** a correct statement for 'configurations' concept :

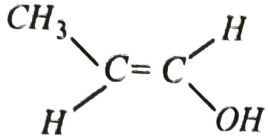
(1) 'Configurations' are three dimensional arrangements in space of the atoms in a molecule which are not interconvertible by rotation around a bond

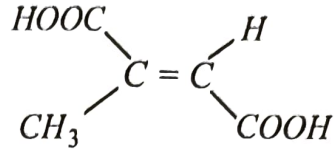
(2) The interconversion does not require breaking and making of bond

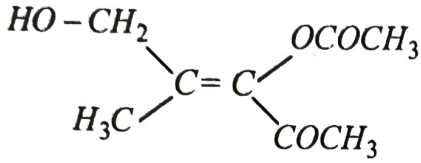
(3) The existence is involved in phenomena of geometrical and optical isomerism

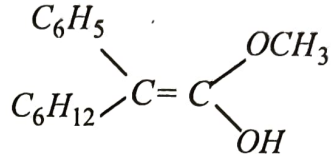
(4) Configurational isomers can exist as pure individual substance.

69. Designate the 'E' and 'Z' nomenclature to the following compounds and select the ***correct*** order from the options given below :

(i) 

(ii) 

(iii) 

(iv) 

(1) (i) E, (ii) Z, (iii) E, (iv) E

(2) (i) E, (ii) E, (iii) E, (iv) Z

(3) (i) Z, (ii) E, (iii) E, (iv) Z

(4) (i) Z, (ii) Z, (iii) E, (iv) E

70. Arrange the following alkanes in increasing order of their boiling points :-

Pentane, 2-methyl hexane, 2-methyl butane and heptane.

(1) Pantane < 2–methyl butane < 2-methyl hexane < heptane

(2) 2-methyl butane < 2-methyl hexane < pentane < heptane

(3) Heptane < pentane < 2-methyl hexane < 2-methyl butane

(4) 2-methyl butane < pentane < 2-methyl hexane < heptane

71. Which has maximum value of $\wedge_{eq}$. at constant temperature assuming 100% ionization of each electrolyte :

(1) 0.1 $M\,H_2SO_4$

(2) 0.1 $M\,H_3PO_3$

(3) 0.1 $M\,H_2PO_4^-$

(4) equal

72. In the variation of $\wedge_m$ with $\sqrt{C}$, $\wedge_m = \wedge_m^\infty \left(A + B \wedge_m^\infty\right)\sqrt{C}$, A & B called :

(1) Vander Waal's constant

(2) Critical constants

(3) Onsagar constants

(4) Debye-Huckel constants

73. Specific conductance has unit :

(1) ohm-cm (2) ohm $^{-1}$ cm

(3) ohm cm $^{-1}$ (4) ohm $^{-1}$ cm $^{-1}$

74. Which has the maximum internal energy :

(1) Helium gas (2) Oxygen gas

(3) Ozone gas (4) equal

75. Which is ***not*** a state function :

(1) q (2) H (3) E (4) G

76. Select the correct alternate about entropy :

(1) $\lim_{T\to\infty} S = 0$ (2) $\lim_{T\to 0} S = \infty$

(3) $\lim_{T\to 0} S = 0$ (4) $S_{(liquid)} > S_{(vapour)}$

77. When one mole of an ideal gas is compared to half its initial volume and simultaneously heated to twice its initial temperature, the change in entropy (ΔS) is :

(1) $C_v \, ln\, 2$ (2) $C_p \, ln\, 2$

(3) $R \, ln\, 2$ (4) $(C_v - R) \, ln\, 2$

78. $H_2O(g) \rightarrow H(g) + OH(g) \;\; \Delta H = x_1$

$OH(g) \rightarrow H(g) + O(g) \;\; \Delta H = x_2$

Based on these value bond energy of $O - H$ bond is :

(1) $x_1 + x_2$ (2) $\frac{x_1 + x_2}{2}$ (3) $\frac{x_1 - x_2}{2}$ (4) $2(x_1 + x_2)$

79. In the following equilibrium :

I $A+2B \rightleftharpoons C, K_{eq} = K_1$

II $C+D \rightleftharpoons 3A \; K_{eq} = K_2$

III $6B+D \rightleftharpoons 2C \; K_{eq} = K_3$

hence :

(1) $3K_1 + K_2 = K_3$ (2) $K_1^3 + K_2^2 = K_3$

(3) $3K_1 + K_2^2 = K_3$ (4) $K_1^3 + K_2 = K_3$

80. Half cell reaction for a half-cell

$Hg(l) + 2OH^-(aq) \rightarrow HgO(S)H_2O(l) + 2e^-$

This half cell is reversible to :

(1) $H_2O(l)$ (2) $HgO(S)$

(3) $OH^-(aq)$ (4) All are correct

81. Hydrazoic acid is :

(1) $H_4P_2O_7$ (2) HNO_4

(3) HN_3 (4) NH_3

82. Pyrosilicates contain the discrete silicate ion :

(1) $Si_2O_7^{6-}$ (2) $Si_3O_9^{6-}$

(3) $Si_6O_{18}^{12-}$ (4) $(SiO_3)_n^{2n-}$

83. The correct order of acidic strength in :

(1) $HClO > HIO > HBrO$ (2) $HIO > HBrO > HClO$

(3) $HClO > HBrO > HIO$ (4) $HBrO > HClO > HIO$

84. The shape of interhalogen ion, ICl_2^- is :

(1) Square planar

(2) Trigonal planar

(3) Linear

(4) Tetrahedral

85. Which noble gas forms maximum components ?

(1) Xenon

(2) Krypton

(3) Argon

(4) Helium

86. Hydrogen bonding is ***not*** present in :

(1) HF

(2) NH_3

(3) HCl

(4) H_2O

87. To prepare P-type semi-conductor, germanium may be doped with :

(1) P

(2) As

(3) In

(4) Sb

88. How many orbitals can have the following numbers, $n = 3$, $l = 1$, $m = 0$

(1) 4

(2) 2

(3) 1

(4) 3

89. 3P orbital has radial nodes :

(1) three

(2) two

(3) one

(4) none

90. The correct order for the size of I, I^+, I^- is :

(1) $I > I^- > I^+$ (2) $I > I^+ > I^-$

(3) $I^- > I > I^+$ (4) $I^+ > I^- > I$

91. d-block elements show all the following properties except :

(1) variable oxidation states (2) catalytic properties

(3) natural radioactivity (4) colour of the compounds

92. *Mo* and *W* belong to group of :

(1) Cu (2) Mn

(3) Fe (4) Cr

93. The complexes $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are examples of :

(1) geometrical isomers (2) co-ordination isomers

(3) linkage isomers (4) position isomers

94. The number of unpaired electron in a d^7 tetrahedral configuration is :

(1) 3 (2) 2

(3) 1 (4) 7

95. In general, a metal complex is regarded as stable if its log β value is :

(1) Zero (2) less than 8

(3) more than 8 (4) 14

96. The spin only magnetic moment for Co^{2+} ion in :

(1) 4.90 B.M. (2) 3.87 B.M.

(3) 2.84 B.M. (4) 1.73 B.M.

97. For laporte forbidden transitions :

(1) $\Delta l = 0$ (2) $\Delta s = 0$

(3) $\Delta l = -1$ (4) $\Delta l = \pm 1$

98. Which of the following does not belong to lanthanides ?

(1) Nd (2) Tm

(3) Cm (4) Ce

99. The oxidation state of U in UO_2^{2+} is :

(1) 4 (2) 2

(3) 6 (4) 3

100. An example of olefin complex is :

(1) Ferrocene (2) Zeise salt

(3) Bis $\left(\eta^6 \text{ - benzene chromium}\right)$ (4) $(CO)_6\, CO_2 (Phc \equiv cPh)$

M.Sc Chemistry Exam held on 22.09.2021 at 10:00 AM Answer Key				
Question No.	A	B	C	D
1	3	2	2	3
2	4	3	4	1
3	3	3	4	1
4	1	3	3	4
5	3	3	1	2
6	2	1	3	1
7	1	1	4	3
8	3	2	2	1
9	3	4	1	4
10	2	2	3	3
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12	3	1	1	1
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36	3	4	1	1
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52	1	1	1	3
53	3	3	2	3
54	4	3	2	3
55	1	1	3	1
56	4	3	3	4
57	2	3	1	2
58	2	3	3	3

Verified

22/9/21

59	4	3	2	2
60	2	3	1	4
61	1	2	3	4
62	3	4	1	2
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95	4	3	1	3
96	1	2	4	2
97	3	3	2	1
98	2	2	2	3
99	3	2	4	3
100	4	4	2	2

Verified

22/9/21