12904   **120 MINUTES**

1. Freons are mixed -----.
   A) Chlorofluorocarbons   B) Bromochlorocarbons
   C) Bromofluorocarbons   D) Chloroiodocarbons

2. ----- does not exist.
   A) ClF_3 B) BrF_3
   C) IF_3 D) ICl_3

3. ----- is used as an anesthetic.
   A) N_2O B) N_2O_3
   C) N_2O_4 D) N_2O_5

4. Carborundum is ----- carbide.
   A) boron   B) silicon
   C) calcium   D) zirconium

5. ----- is diamagnetic.
   A) O_2 B) O_2^+ C) O_2^{++} D) O_2^-

6. The actinium series is ----- series.
   A) $4n$ B) $(4n+1)$ C) $(4n+2)$ D) $(4n+3)$

7. How many **d** electrons are present in Cr of potassium dichromate?
   A) 0   B) 5   C) 6   D) 7

8. Zr^{4+} and ----- occur together in nature.
   A) Ti^{4+} B) Hf^{4+} C) Sn^{4+} D) Pb^{4+}

9. ----- is the most stable oxidation state of U.
   A) +3   B) +4   C) +5   D) +6

10. ----- complexes are used as NMR shift reagents.
    A) La^{3+} B) Gd^{3+} C) Lu^{3+} D) Ac^{3+}

11. ----- are least prone to complex formation among the following.
    A) Lanthanides   B) Actinides
    C) 3d transition metals   D) 4d transition metals

12. ----- has the maximum value of magnetic moment at room temperature.
    A) Eu^{3+} B) Gd^{3+} C) Tb^{3+} D) Dy^{3+}

13. AgCl is soluble in ammonia due to the formation of -----.
    A) $[Ag(NH_3)_2]^{2+}$ B) $[Ag(NH_3)_2]^+$
    C) $[Ag(NH_3)_4]^{2+}$ D) $[Ag(NH_3)_4]^+$

14. ----- isomerism is exhibited by $[Co(NH_3)_5NO_2]^{2+}$.
    A) Ionisation   B) Linkage
    C) Coordination   D) Polymerisation

15. $Cr_2Ac_4.2H_2O$ is ----- magnetic at room temperature.
    A) dia   B) para
    C) ferro   D) ferri

16. ----- is optically active.
    A) Cis $[Co(NH_3)_4Cl_2]^+$ B) Trans $[Co(NH_3)_4Cl_2]^+$
    C) Cis $[Co(en)_2Cl_2]^+$ D) Trans $[Co(en)_2Cl_2]^+$

17. The electronic spectrum of $[Cr(H_2O)_6]^{3+}$ shows ----- absorption peaks.
    A) 1   B) 2
    C) 3   D) 4

18. The pale pink colour of $[Mn(H_2O)_6]^{2+}$ is due to -----.
    A) spin orbit coupling   B) vibronic coupling
    C) CT transition   D) none of above

19. ----- is tetragonal.
    A) $[Fe(H_2O)_6]^{2+}$ B) $[Co(H_2O)_6]^{2+}$
    C) $[Ni(H_2O)_6]^{2+}$ D) $[CuH_2O)_6]^{2+}$

20. ----- does not satisfy the 18-electron rule.
    A) $Cr(CO)_6$ B) $Mn(CO)_5$
    C) $Ni(PF_3)_4$ D) $Fe(CO)_4PPh_3$

21. Trans-$ML_2(CO)_4$ [where L=$(C_2H_5)_3P$] shows ----- CO stretching IR band/s.
    A) 1   B) 2   C) 3   D) 4

22. The number of unpaired electrons present in Cp_2Co is -----
    A) 0   B) 1   C) 2   D) 3

23. The metal present in vitamin B_{12} is -----.
    A) Fe   B) Co   C) Ni   D) Cu

24. Ferredoxins contain ----- clusters.
    A) Fe-N   B) Fe-O   C) Fe-S   D) Fe-Cl

25. ----- is the most abundant metal in the earth's crust.
    A) Fe   B) Ca   C) Al   D) Mg

26. The carbon content is lowest in -----.
    A) Pig iron   B) Mild steel
    C) Medium steel   D) Tool steel

27. The Wacker process is used for the synthesis of -----.
    A)   Ethylene   B)   Acetone
    C)   Acetaldehyde   D)   Methanol

28. Zeigler Natta catalyst is used for the -----.
    A)   Oxo process   B)   Monsato actic acid process
    C)   Polymerization of alkenes   D)   Water-gas shift reaction

29. Zone refining is not used for the purification of -----.
    A)   Ga   B)   Si   C)   Ge   D)   Sn

30. Both Frenkel and Schottky defects are found in the crystal of -----.
    A)   NaCl   B)   AgCl   C)   AgBr   D)   FeS

31. How many Cl^- ions surround each Cs^+ ion in CsCl lattice?
    A)   3   B)   4   C)   6   D)   8

32. Ti is not present in -----.
    A)   Rutile   B)   Anatase C)   Monazite D)   Ilmenite

33. Solids containing F-centres are -----.
    A)   Dia   B)   Para   C)   Ferro   D)   Ferri

34. An n-type semiconductor is obtained by doping Ge with -----.
    A)   Ga   B)   In   C)   As   D)   Si

35. ----- is the pyroelectric material.
    A)   MnO   B)   FeO   C)   NiO   D)   ZnO

36. How many significant figures are there in the number 9.50×10^3.
    A)   2   B)   3   C)   5   D)   6

37. Random error is -----.
    A)   Always zero
    B)   Always positive
    C)   Always negative
    D)   Sometimes positive and sometimes negative

38. The pH at the equivalence point for the titration of a strong acid with a weak base
    is -----.
    A)   7   B)   > 7
    C)   < 7   D)   None of above

39. $KMnO_4$ serves as its own indicator of redox titrations in ----- solution.
    A)   acidic   B)   neutral
    C)   alkaline   D)   both neutral and alkaline

40. The precipitating agent dimethylglyoxime is not used for the gravimetric estimation of -----.
   A) Ca^{2+} B) Ni^{2+} C) Pd^{2+} D) Pt^{2+}

41. Which among the following compound is most aromatic?
   A) Pyrrole   B) Pyridine
   C) Pyrimidine   D) Thiophene

42. The hybridization state of the triple bonded carbons in benzyne is -----.
   A) sp^3 B) sp   C) sp^2 D) nil

43. Which of the following carbocations is least stable?
   A) Phenyl   B) Benzyl
   C) Ethyl   D) Isopropyl

44. Which among the following will undergo Cannizzaro reaction?
   A) Acetaldehyde   B) Phenylacetaldehyde
   C) Formaldehyde   D) Acetone

45. Ethyl magnesium bromide on treatment with CO_2 followed by hydrolysis gives---.
   A) Ethyl alcohol   B) Propyl alcohol
   C) Isopropyl alcohol   D) Propionic acid

46. The electrophile involved in Riemer–Tiemann reaction is -----.
   A) ^+CHO B) CH_2O^+
   C) $:CCl_2$ D) $^+CHCl_2$

47. In the following compound the absolute configuration of C_2 and C_3 are -----.

$$\begin{array}{c} COOH \\ | \\ {}_2HN\text{--}{}^2C\text{--}H \\ | \\ H\text{--}{}^3C\text{--}OH \\ | \\ CH_3 \end{array}$$

   A) 2S,3R   B) 2R,3S   C) 2S,3S   D) 2R,3R

48. Which of the following isomers is optically inactive?
   A) Cis-1,3-dimethylcyclohexane
   B) Trans-1,3-dimethylcyclohexane
   C) Cis-1,4-dimethylcyclohexane
   D) Trans-1,4-dimethylcyclohexane

49.   What is the major product of the following reaction?

$$CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2-CH_3 \quad \xrightarrow[CH_3OH]{NaBH_4}$$

   A)   S-2-Butanol
   B)   R-2-Butanol
   C)   Racemic mixture
   D)   2-hydroxy-2-methoxybutane

50.   The photochemical [2+2] cycloaddition of a carbonyl with an olefin to give an oxetane is called ----- reaction.
   A)   Barton   B)   Norrish type I
   C)   Norrish type II   D)   Paterno-Buchi

51.   The photochemical conversion of 1,4-pentadiene to vinyl cyclopropane is called -- rearrangement.
   A)   Di-pi-methane   B)   Fries
   C)   Claisen   D)   Wagner-Merwein

52.   The Diels-Alder reaction is -----.
   A)   Stereospecific, regiospecific and endoselective
   B)   Stereoselective, oregiospecific and endoselective
   C)   Stereospecific, regioselective and exoselective
   D)   Stereospecific, regioselective and endoselective

53.   The Cope rearrangement is an example of sigmatropic reaction with the order-----.
   A)   (1,3)   B)   (1,5)   C)   (3,3)   D)   (3,5)

54.   The number of prochiral centers in 1,3-dibromopropane is -----.
   A)   0   B)   1   C)   2   D)   3

55.   Which of the following transition is most intense in carbonyl compounds?
   A) $\sigma \rightarrow \sigma^*$ B) $\pi \rightarrow \pi^*$ C) $n \rightarrow \sigma^*$ D) $n \rightarrow \pi^*$

56.   The number signals observed in the ^{1}H NMR spectrum of ethyl acetate is -----.
   A)   1   B)   2   C)   3   D)   4

57.   Cellulose is a polymer of -----.
   A)   α-D-glucose   B)   β- D-glucose
   C)   β- D-galactose   D)   β- D-gulose

58.   In DNA the nucleoside units are linked together by ----- bond.
   A)   amide   B)   phosphodiester
   C)   glycosidic   D)   disulfide

5

59. Which among the following compounds will not undergo cleavage with periodic acid?
A) Glycerol
B) Glucose
C) Glycolic acid
D) Glyceraldehyde.

60. Which among the following is a purine base?
A) Thymine
B) Cytosine
C) Guanine
D) Uracil

61. Condensation of a diester in the presence of a base to give a cyclic β-ketoester is known as ----- condensation.
A) Aldol
B) Perkin
C) Claisen
D) Dieckmann

62. The following reaction is an example of ----condensation reaction.
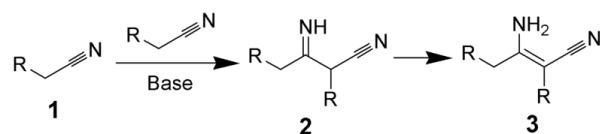
A) Perkin
B) Acyloin
C) Benzoin
D) Thorpe

63. The multi-component condensation of a nonenolizable aldehyde, a primary or secondary amine and an enolizable carbonyl compound to afford β-dialkylaminocarbonyl compound is called ----- reaction.
A) Reformatsky
B) MPV
C) Mannich
D) Stork enamine

64. During the structure elucidation of alkaloids the number of methoxyl groups present is estimated by ----- method.
A) Kuhn-Roth
B) Hofmann
C) Herzig-Meyer
D) Zeisel

65. Quinine belongs to ----- class of alkaloids.
A) pyridine
B) tropane
C) isoquinoline
D) quinoline

66. Cholesterol is a ----- lipid.
A) simple
B) compound
C) derived
D) glyco

67. Camphor is obtained from isoborneol by -----.
A) Oxidation
B) Reduction
C) Hydrolysis
D) Dehydration

68. Biotin is -----.
    A) Vitamin A
    B) Vitamin B_5
    C) Vitamin B_3
    D) Vitamin H

69. Edman reagent is -----.
    A) Phenylisocyanate
    B) Phenylthiocyanate
    C) Phenylisothiocyanate
    D) 1-fluoro-2,4-dinitrobenzene

70. The most acidic proton in the following compound is attached to carbon -----.
    $^4CH_3$- $^3CH_2$- $^2CH_2$- ^1CHO
    A) 1
    B) 2
    C) 3
    D) 4

71. Tropilium cation is -----.
    A) Antiaromatic
    B) Homoaromatic
    C) Heteroaromatic
    D) Nonaromatic

72. Which of the following bond has highest IR stretching frequency?
    A) C-H
    B) C-C
    C) C-N
    D) C-O

73. The correct order for the basic features of a mass spectrometer is -----.
    A) Acceleration, deflection, detection, ionisation
    B) Ionisation, acceleration, deflection, detection
    C) Acceleration, ionisation, deflection, detection
    D) Acceleration, deflection, ionisation, detection

74. Which of the following substrates will have maximum rate for hydrolysis under SN1 reaction conditions?
    A) Ethyl chloride
    B) Chlorobenzene
    C) Methyl chloride
    D) Benzyl chloride

75 The effect of chain transfer reagents is to -----.
    A) Increase the average degree of polymerization
    B) Increase the rate of polymerization
    C) Reduce average degree of polymerization
    D) Reduce the rate of polymerisation

76. In ionic polymerisation "living polymer" is formed when -----.
    A) Propagation reactions do not occur
    B) Termination reactions do not occur
    C) Initiation reactions occur faster than termination reactions
    D) Amino acids are used as monomers

77. During a step growth polymerisation -----.
    A) Monomer molecules are still present in the final polymer
    B) Monomer breaks down to form free radicals
    C) Monomer breaks down to form ions
    D) Monomer disappears early in the reaction

78. Which of the following statements is true for all chromatographic techniques?
    A) R_f value of individual components can be calculated
    B) Components soluble in water are used.
    C) Stationary and mobile phases are used
    D) Nonpolar eluents are used

79. Which of the following is the most suitable gas to use as a carrier gas in a gas chromatogram?
    A) Methane   B) Carbon dioxide
    C) Helium   D) Oxygen

80. Gel electrophoresis separates DNA fragments based on their -----.
    A) Molecular size   B) Polarity
    C) Solubility   D) Electric charge

81. According to de Broglie hypothesis, the wave length of a particle is -----.
    A) Directly proportional to its mass
    B) Directly proportional to its energy
    C) Directly proportional to its momentum
    D) Inversely proportional to its momentum

82. Which among the following will have maximum wave character if they move with identical speeds?
    A) Electrons   B) Protons
    C) Neutrons   D) Alpha particles

83. The energy of a particle in a one-dimensional box is given by -----.
    A) $nh^2/8ma^2$ B) $n^2h^2/8ma^2$
    C) $n^2h^2/4ma^2$ D) $nh^2/4ma^2$

84. The number of radial nodes for the 3s orbital of hydrogen atom is -----.
    A) 0   B) 1   C) 2   D) 3

85. The ground state term symbol of Ni^{2+} is -----.
    A) $^3F_2$ B) $^3F_4$ C) $^3D_2$ D) $^3D_4$

86. What is the bond order of NO?
    A) 1.5   B) 2   C) 2.5   D) 3

87. The hybridization of carbon atom in graphite is -----.
    A) sp   B) sp^2 C) sp^3 D) p^3s

88. The angle between the three iodine atoms of I_3^- ion is -----.
    A) 60   B) 90   C) 120   D) 180

89. BF_3 belongs to ----- point group.
    A) C_{3v} B) C_{4v} C) D_{3h} D) D_{4h}

90. Molecules possessing dipole moments do not belong to the ----- point group.
    A) C_n B) C_s C) C_{nv} D) C_{nh}

91. Among X-rays, UV, IR and Visible light, which has longest wavelength?
    A) X-rays   B) IR
    C) UV   D) Visible light

92. Which among the following is a spherical top molecule?
    A) H_2O B) C_6H_6 C) CH_4 D) CH_3Cl

93. The selection rule for a molecule to be IR active is that -----.
    A) It should have a permanent dipole moment
    B) It should have a permanent polarisability
    C) It should have a change in dipole moment during irradiation
    D) It should have a functional group

94. The very intense colour of permanganate is due to ----- transition.
    A) $\sigma \rightarrow \sigma^*$ B) $n \rightarrow \sigma^*$ C) $n \rightarrow \pi^*$ D) $\pi \rightarrow \pi^*$

95. The free radicals can be studied by ----- spectroscopy.
    A) IR   B) UV   C) NMR   D) ESR

96. The most probable speed of a gas molecule is given by -----.
    A) $(2RT/M)^{1/2}$ B) $(3RT/M)^{1/2}$
    C) $(4RT/\pi M)^{1/2}$ D) $(2RT/\pi M)^{1/2}$

97. The rate of diffusion of a gas is -----.
    A) Directly proportional to its molecular weight
    B) Inversely proportional to its molecular weight
    C) Independent of its molecular weight
    D) Inversely proportional to its temperature

98. Mean free path may be defined as the -----.
    A) Average distance between two successive collisions of a molecule
    B) Average intermolecular space between molecules
    C) Path of minimum free energy change
    D) Path of maximum free energy change

99. Two solutions of identical osmotic pressure are said to be -----.
    A) Isonormal   B) Isobaric
    C) Isotonic   D) Equinormal

100. The term 'mesophase' is associated with ----- crystals.
    A) metallic   B) covalent
    C) liquid   D) molecular

101. Spontaneous processes are accompanied by -----.
    A) Increase of G and decrease of S
    B) Increase of S and decrease of G
    C) Increases of both G and S
    D) Decreases of both G and S

102. The differential of ----- is inexact.
    A) G   B) U
    C) w   D) S

103. At 0K the entropy of CO is -----.
    A) zero   B) > zero
    C) < zero   D) None of above

104. What is the influence of temperature (T) on the equilibrium constant (K) of a reaction?
    A) K increases with T
    B) K decreases when T is raised
    C) K is independent of T
    D) K increases with T only if the reaction is endothermic

105. The canonical ensemble partition function (Q) for an ideal gas is related to the single molecule partition function (q) by the relation -----.
    A) $Q = q^N / N$ B) $Q = N^q / N!$
    C) $Q = q^N / N!$ D) $Q = N! / q^N$

106. ----- is not a fermion.
    A) Electron   B) Proton   C) Neutron   D) ^4He

107. For a zero order reaction, the initial concentration is 2.0 M. After one minute the concentration is changed to 1.0 M. The rate constant for the reaction is
    A) $0.034 \, MS^{-1}$ B) $0.034 \, M^{-1}S$
    C) $0.017 \, MS^{-1}$ D) $0.017 M^{-1}S$

108. ----- is not a kinetic parameter.
    A) Zero point energy   B) Activation energy
    C) Entropy of activation   D) Pre-exponential factor

109. The Lindemann-Hinshelwood mechanism is used to explain ----- reaction.
    A) unimolecular   B) bimolecular
    C) trimolecular   D) tetramolecular

110. The temperature dependence of reaction rates is represented in the ----- equation.
    A) Arrhenius   B) Clapeyron
    C) Eyring   D) Debye

111. BET equation represents ----- adsorption.
    A) monolayer   B) double layer
    C) triple layer   D) multilayer

112. For the aqueous solution-air interface ----- is a capillary inactive solute.
    A) acetone   B) diethyl ether
    C) ethyl acetate   D) glycerine

113. The scattering of light by colloidal particles is known as ----- effect
    A) Cotton   B) Tyndall
    C) Raman   D) Rayleigh

114. ----- is used to study the structure of surfaces.
    A) Mass Spectroscopy   B) Scanning Tunneling Microscopy
    C) Mossbauer Spectroscopy   D) Raman Spectroscopy

115. A catalyst speeds up a reaction by -----.
    A) Increasing the equilibrium constant
    B) Decreasing the equilibrium constant
    C) Increasing the free energy of activation
    D) Decreasing the free energy of activation

116. The molar conductance of an electrolyte is -----.
    A) Maximum at infinite dilution B) Minimum at infinite dilution
    C) Independent of dilution   D) Independent of temperature

117. The ionic strength of one molal solution of $FeSO_4$ is -----.
    A) 1   B) 2   C) 4   D) 8

118. ----- is used for making salt bridge.
    A) NaCl   B) KCl   C) NaBr   D) KBr

119. When a dilute solution of H_2SO_4 is electrolyzed using Pt electrodes, the product on the anode is ----- gas.
    A) H_2 B) O_2 C) SO_2 D) SO_3

120. In electrogravimetric analysis the analyte is quantitatively deposited as a solid on the -----.
    A) Cathode   B) Anode
    C) Cathode or anode   D) Cathode and anode

11