CHEMISTRY (PG)

1. The purple colour of MnO_4^- is due to

   (A) L to M charge transfer
   (B) M to L charge transfer
   (C) d-d transition
   (D) f-f transition

2. Sulphide ores are generally concentrated by

   (A) Froth flotation
   (B) Roasting
   (C) Magnetic separation
   (D) Carbon reduction

3. Which of the following has regular tetrahedral structure?

   (A) $[Ni(CN)_4]^{2-}$
   (B) SF_4
   (C) BF_4^-
   (D) XeF_4

4. The smallest ionic radius among the following is for:

   (A) K^+
   (B) Ca^{2+}
   (C) Sc^{3+}
   (D) Ti^{4+}

5. Which of the following is only acidic in nature?

   (A) $Be(OH)_2$
   (B) $Mg(OH)_2$
   (C) $B(OH)_3$
   (D) $Al(OH)_3$

6. The metal present in Vitamin B_{12} is

   (A) Mg
   (B) Fe
   (C) Co
   (D) Zn

7. Ionic radii of K^+, Ca^{2+}, Cl^-, S^{2-} ions decrease in the order

   (A) $Cl^- > S^{2-} > K^+ > Ca^{2+}$
   (B) $K^+ > Ca^{2+} > Cl^- > S^{2-}$
   (C) $S^{2-} > Cl^- > K^+ > Ca^{2+}$
   (D) $Ca^{2+} > K^+ > Cl^- > S^{2-}$

8. Which of the following molecules has three fold axis of symmetry?

   (A) NH_3
   (B) C_2H_4
   (C) CO_2
   (D) SO_2

9. The metallic character of beryllium is due to

   (A) partially filled 2s band
   (B) completely filled 2s band
   (C) overlap of 2s and 2p band
   (D) empty 2p band

10. Which of the following contains P-O-P bond?

   (A) Hypophosphorous acid
   (B) Phosphorous acid
   (C) Pyrophosphoric acid
   (D) Orthophosphoric acid

11. Cubic unit cell is defined by

   (A) $a \neq b \neq c$, $\alpha = \beta = \gamma = 90°$
   (B) $a = b = c$, $\alpha = \beta = \gamma = 90°$
   (C) $a = b \neq c$, $\alpha = \beta = \gamma = 90°$, $\gamma = 120°$
   (D) $a = b = c$, $\alpha \neq \beta \neq \gamma$

12. Which second-row transition can form compounds in which the metal has the +8 oxidation state?

   (A) Palladium
   (B) Ruthenium
   (C) Molybdenum
   (D) Cadmium

13. The most important ore of aluminium is

    (A) bauxite
    (B) magnetite
    (C) haematite
    (D) monazite

14. Among the following shortest bond length is found in

    (A) C_2
    (B) N_2
    (C) O_2
    (D) F_2

15. Ziegler-Natta catalyst for polymerization of ethylene consists of $TiCl_4$ and

    (A) triethylaluminium
    (B) triphenyl phosphine
    (C) EDTA
    (D) triethylphosphine

16. Which one of the following is the weakest Lewis base?

    (A) CH_3^-
    (B) NH_2^-
    (C) OH^-
    (D) F^-

17. What is the bond order of O_2^+ ?

    (A) 3
    (B) 2
    (C) 1
    (D) 2.5

18. P_4O_{10} is the anhydride of

    (A) H_3PO_2
    (B) H_3PO_3
    (C) H_3PO_4
    (D) $H_4P_2O_7$

19. A positron ion is emitted from $_{23}Na^{11}$, the ratio of the atomic mass and atomic number of the resulting nuclide is

   (A) 22/10
   (B) 22/11
   (C) 23/10
   (D) 23/12

20. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is

   (A) 3
   (B) 4
   (C) 5
   (D) 6

21. $[Ni(CN)_4]^{2-}$ is diamagnetic. The hybridization of nickel in this complex is

   (A) sp^3
   (B) dsp^2
   (C) d^2sp^3
   (D) dsp^3

22. The calculated magnetic moment (B. M.) of Eu^{3+} system will be

   (A) 0
   (B) 3.42
   (C) 7.91
   (D) 3.61

23. Dual character of an electron was explained by

   (A) Bohr
   (B) Heisenberg
   (C) de Broglie
   (D) Pauli

24. The IUPAC name for the complex $[Co(NO_2)(NH_3)_5]Cl_2$ is

   (A) nitrito-N-pentaamminecobalt(III) chloride
   (B) nitrito-N-pentaamminecobalt(II) chloride
   (C) pentaamminenitrito-N-cobalt(II) chloride
   (D) pentaamminenitrito-N-cobalt(III) chloride

25. Hydrogen bomb is based on the principle of

    (A) Nuclear fission
    (B) Natural radioactivity
    (C) Nuclear fusion
    (D) Artificial radioactivity

26. In oxy-hemoglobin the iron is

    (A) Low spin, paramagnetic
    (B) High spin, diamagnetic
    (C) Low spin, diamagnetic
    (D) High spin, paramagnetic

27. In which one of the following pairs do the species have similar geometry?

    (A) CO_2 and SO_2

    (B) NH_3 and BH_3

    (C) CO_3^{2-} and SO_3^{2-}

    (D) SO_4^{2-} and ClO_4^{-}

28. Which isotope is used for dating archeological finding?

    (A) $^{92}U_{235}$
    (B) $^{1}H_{3}$
    (C) $^{8}O_{18}$
    (D) $^{6}C_{14}$

29. Which statements best describe the structure of NaCl?

    (I)   Each sodium ion is surrounded by six chloride ions.
    (II) The chloride ions are arranged octahedrally around each sodium ion.
    (III) The lattice forms cubic structure.

    (A) I and II only
    (B) I and III only
    (C) II and III only
    (D) All of the above

30. Predict the number of unpaired electron and spin only magnetic moments for the following compound $[Ru(NH_3)_6]^{3+}$.

(A) 1 and 1.73µB
(B) 2 and 2.8µB
(C) 3 and 3.8µB
(D) 0 and 0.5µB

31. Which of the following can function as a hexadentate ligand?

(A) ethylenediamine
(B) EDTA
(C) CO
(D) $C_2O_4^{2-}$

32. The set of ions in which the members all have the same electron configuration is

(A) Fe^{2+}, Fe^{3+}
(B) N^{3-}, O^{2-}, F^-
(C) SO_4^{2-}, SeO_4^{2-}, TeO_4^{2-}
(D) F^-, C^-, Br^-

33. Which of the following element has the highest first ionization energy?

(A) As
(B) Ge
(C) Ga
(D) Rb

34. Which of the following species: CO_2, H_2O, $BeCl_2$, and N_2O have the same molecular geometry?

(A) CO_2 and N_2O only
(B) H_2O and N_2O only
(C) H_2O and $BeCl_2$ only
(D) CO_2, $BeCl_2$, and N_2O

35. Which of the following compounds is expected to have the strongest ionic bond?

(A) KoF
(B) NaF
(C) NaI
(D) CsBr

36. In accordance with crystal field theory, the metal ion –ligand interaction is

(A) Covalent
(B) Acid-Base
(C) Electrostatic
(D) None of the above

37. CFSE of $[Cr(H_2O)_6]^{2+}$
   (A) $-16.0\Delta o$
   (B) $-0.6\ \Delta o$
   (C) $+0.6\ \Delta o$
   (D) $-0.4\ \Delta o$

38. EAN of $[Co(NH_3)_6]^{3+}$ is

   (A) 38
   (B) 34
   (C) 36
   (D) 46

39. Water gas is an equimolar mixture of

   (A) CO_2 and N_2
   (B) CO and H_2O
   (C) CO and H_2
   (D) CO_2 and H_2O

40. Find the missing particle in the following nuclear reaction
   $$_0n^1 \rightarrow \ _1p^1 + ?$$

   (A) γ rays

   (B) H^-

   (C) $_{-1}e^0$
   (D) $_{+1}e^0$

41. The actual shape of XeF_6 is

   (A) Square pyramidal
   (B) Octahedral
   (C) Pentagonal bipyramidal
   (D) Distorted octahedral

42. Coordination number and oxidation state of Cr in $K_3[Cr(C_2O_4)_3]$ are respectively

   (A) 3 and +3
   (B) 3 and 0
   (C) 6 and +3
   (D) 6 and +4

43. Which of the following system has maximum number of unpaired electrons?

    (A) d^5 (tetrahedral, high spin)
    (B) d^6 (octahedral, high spin)
    (C) d^4 (octahedral, low spin)
    (D) d^7 (octahedral, high spin)

44. The number of unpaired electrons in tetrahedral $[Ni(CO)_4]$ complex is

    (A) 2
    (B) 4
    (C) 0
    (D) 3

45. The crystal field splitting energy for octahedral (Δ_o) and tetrahedral (Δ_t) complexes is related as

    (A) $\Delta_t \approx 4/9\ \Delta_o$
    (B) $\Delta_t \approx 1/2\ \Delta_o$
    (C) $\Delta_o \approx 2\ \Delta_t$
    (D) $\Delta_o \approx 4/9\ \Delta_t$

46. Which of the following products is obtained on heating, B_2H_6 with NH_3 in the ratio (1:2) at higher temperature?

    (A) $B_3N_3H_3$
    (B) $B_2H_6 2NH_3$
    (C) Boron nitride
    (D) $B_3N_3H_6$

47. I^{3-} ion is

    (A) Linear
    (B) Triangular
    (C) Bent
    (D) Tetrahedral

48. Germanium is an example of a/an

    (A) intrinsic semiconductor
    (B) n-type semiconductor
    (C) p-type semiconductor
    (D) extrinsic semiconductor

49. Which is called white graphite?

   (A) SiO_2
   (B) CaC_2
   (C) BN
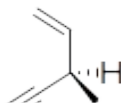   (D) B_2O_3

50. The chemical constituent of clay is

   (A) Silicon oxide
   (B) Aluminum borosilicate
   (C) Zeolite
   (D) Aluminum silicate

51. Among compounds **1**, **2, 3** and **4**, which will exhibit optical activity?

   1   2   3   4

   (A) Compounds **1** and **4**
   (B) Compound **1** only
   (C) Compounds **1, 2** and **4**
   (D) All compounds are optically inactive

52. IUPAC name for the compound shown below is:

   (A) (S)-3-methylpent-1-en-4-yne
   (B) (R)-3-methylpent-1-yn-4-ene
   (C) (R)-3-methylpent-1-en-4-yne
   (D) (S)-3-methylpent-1-yn-4-ene

53. ✓ -D-Glucopyranose and β-D-glucopyranose do not constitute a pair of

   (A) geomertical isomers
   (B) epimers
   (C) enantiomers
   (D) diasteromers

54. Which among the following reactions is suitable for isolation of isocynates in pure form?

   (A) Beckmann rearrangement
   (B) Curtius rearrangement
   (C) Hofmann rearrangement
   (D) Fries rearrangement

55. Use Woodward-Fieser rules to predict absorption maximum for the given compound
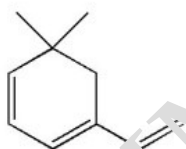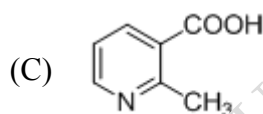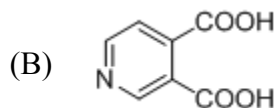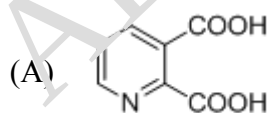
   (A) 302 nm
   (B) 293 nm
   (C) 272 nm
   (D) 252 nm
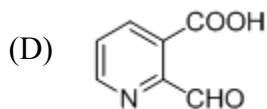
56. β-Sheet found in a protein can be considered as an example of

   (A) Primary structure
   (B) Tertiary structure
   (C) Quaternary structure
   (D) Secondary structure

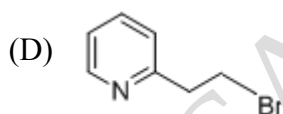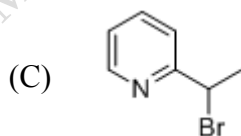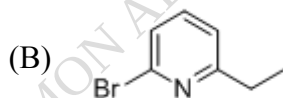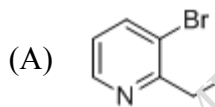57. A strong peak at 1700 cm^{-1} in IR spectrum indicates the presence of the functional group

   (A) Terminal Acetylene
   (B) Nitro Group
   (C) Carbonyl
   (D) Nitrile (C≡N)

58. Quinoline on oxidation with alkaline $KMnO_4$ followed by acidification gives

   (A)
   (B)
   (C)

(D) [structure: pyridine ring with COOH at position 3 and CHO at position 2]

59. 2-Ethylpyridine reacts with N-bromosuccinimide to give a brominated product. Structure of the brominated product is

(A) [structure: pyridine ring with Br at position 3 and CH2 group at position 2]

(B) [structure: pyridine ring with Br at position 2 and ethyl at position 6]

(C) [structure: pyridine ring with CH(CH3)Br group at position 2, Br below]

(D) [structure: pyridine ring with CH2CH2Br group at position 2]

60. Oxidation of aniline with MnO_2 and H_2SO_4 gives

(A) Phenylhydroxylamine
(B) Nitrobenzene
(C) p-Benzoquinone
(D) Phenol

61. The reaction of pyridine with sodamide in liquid ammonia to yield 2-aminopyridine is

(A) a nucleophilic substitution reaction on pyridine
(B) an electrophilic substitution reaction on pyridine
(C) a free radical substitution reaction on pyridine
(D) pericyclic reaction

62. Longifolene ($C_{15}H_{24}$) is categorized as a

[structure of longifolene]
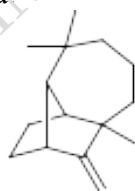
(A) polycyclic flavonoid

(B)   diterpene
(C)   tripterpene
(D)   sesquiterpene

63. The order of basicity among pyrrole, pyridine and piperidine is

   (A) Pyridine > Piperidine > Pyrrole
   (B) Pyrrole > Piperidine > Pyridine
   (C) Piperidine > Pyrrole > Pyridine
   (D) Piperidine > Pyridine > Pyrrole
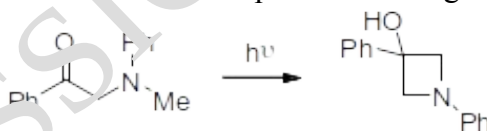
64. The name of the rearrangement given below is

   (A) Fries rearrangement
   (B) Claisen rearrangement
   (C) Favorskii rearrangement
   (D) Wagner-Meerwein rearrangement

65. Which among the following is used as a free radical initiator?

   (A) Benzoyl peroxide
   (B) KI
   (C) CH_3I
   (D) Nitrobenzene

66. The following photochemical transformation proceeds through

   (A) Norrish type I reaction
   (B) ■-hydrogen abstraction
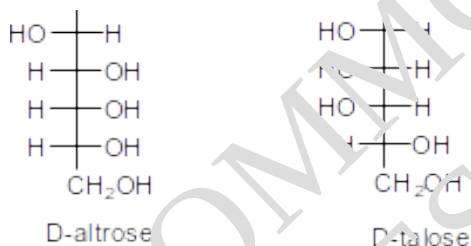   (C) Barton reaction
   (D) Paterno-Buchi reaction

67. The ligand system present in vitamin B_{12} is

   (A) Porphyrin
   (B) Crown ether
   (C) Corrin
   (D) Heme

68. A vitamin which exists as an ene-diol is

   (A) Vitamin A
   (B) Vitamin B_2
   (C) Vitamin C
   (D) Vitamin K

69. Which among the following reactions will give the same product from the following aldohexoses?

```
HO——H          HO——H
H——OH          HO——H
H——OH          HO——H
H——OH          H——OH
  CH₂OH           CH₂OH
 D-altrose        D-talose
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   (A) Oxidation with HNO_3
   (B) Oxidation with $HOBr$
   (C) Wohl degradation
   (D) Ruff degradation

70. Rapid interconversion of α-D-glucose and β-D-glucose in solution is known as

   (A) Mutarotation
   (B) Racemisation
   (C) Asymmetric induction
   (D) Fluxional isomerisation

71. In the structure elucidation of alkaloids the number of methoxyl group present is estimated by

   (A) Kuhn-Roth method
   (B) Hofmann method
   (C) Herzig-Meyer method
   (D) Zeisel method

72. Aromatic electrophilic substitution on pyridine is preferentially at position/positions

   (A) 2 and 4
   (B) 3
   (C) 4
   (D) 2

73. Friedlander Quinoline synthesis involves reaction between the following reagents

   (A) Aniline and glycerol
   (B) o-aminobenzaldehyde and α-methylene carbonyl compound
   (C) acetoacetic ester and aniline
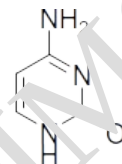   (D) anthranilic acid and acetophenone

74. The following are the four heteroaromatic bases present in DNA. Which base pair can form three hydrogen bonds?
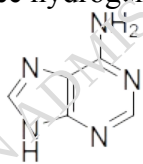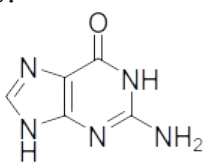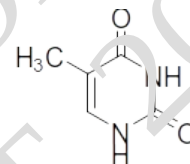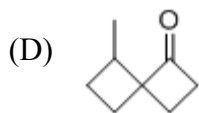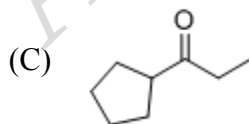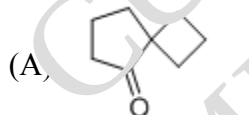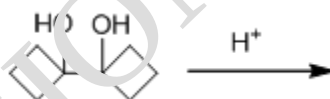

adenine (A)　　　guanine (G)　　　cytosine (C)　　　thymine (T)

   (A) A-C
   (B) A-T
   (C) G-C
   (D) G-T

75. Which is the main acid-catalyzed rearrangement product of the following 1, 2-diol?

   (A)

   (B)

   (C)

   (D)

76. Which of the following molecules does not have a dipole moment?

(A) CH_3Cl
(B) CH_2Cl_2
(C) $CHCl_3$
(D) CCl_4

77. In the most stable conformer of but-1-yn-1-ylcyclohexane a maximum of how many carbon atoms will remain collinear?
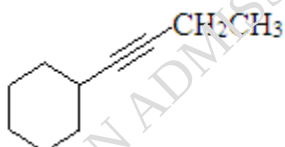
(A) 3
(B) 5
(C) 2
(D) 4

78. Which among the following is least reactive towards an electrophile?

(A)

(B)

(C)

(D)
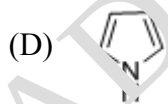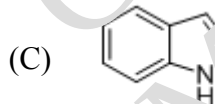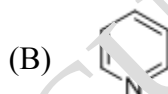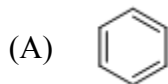
79. Which list below gives NMR active nuclei only?

(A) ^1H, ^{13}C, ^{19}F
(B) ^1H, ^2H, ^{12}C
(C) ^2H, ^{12}C, ^{19}F
(D) ^3H, ^{14}C, ^{31}P

80. In which of the following are the π-electrons not delocalized?

(A) An α,β-unsaturated ketone

(B) Buta-1,3-diene
(C) Hepta-1,6-diene
(D) Allyl anion

81. Which molecule best corresponds to IR spectrum below with molecular formula $C_6H_{14}O$

(A) ![structure] $\diagdown\diagup\diagdown\diagup$ OH

(B) structure with OH

(C) structure with O

(D) structure with OH
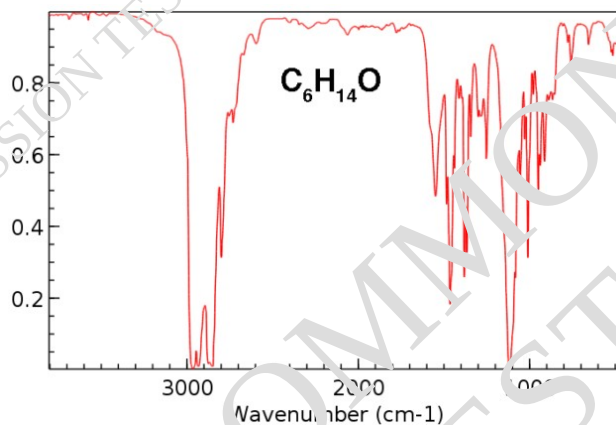
82. The product formed in Aldol condensation is

(A) a β-hydroxy aldehyde or a -hydroxy ketone
(B) an -hydroxy aldehyde or ketone
(C) an -unsaturated ester
(D) -hydroxy acid

83. In which of the following reactions new carbon-carbon bond is not formed?

(A) Cannizzaro reaction
(B) Wurtz reaction
(C) Reimer-Tiemann reaction
(D) Friedel-Crafts reaction

84. Which among the following has the most acidic hydrogen?

(A) 3-Hexanone
(B) 2,4-Hexanedione
(C) 2,5-Hexanedione

(D)   2,3-Hexanedione

85. Acyl chlorides are made by reacting carboxylic acids with

   (A) $AlCl_3$
   (B) HCl
   (C) Cl_2
   (D) PCl_5

86. What is the correct order of reactivity (most reactive first) of pyrrole, furan and thiophene towards electrophilic substitution?

   (A) furan > pyrrole > thiophene
   (B) thiophene > pyrrole > furan
   (C) furan > thiophene > pyrrole
   (D) pyrrole > furan > thiophene

87. But-2-yne can be stereoselectively reduced to give either the cis or trans isomer of but-2-ene. Which among the following statements is true for the reduction of but-2-yne to but-2-ene?

   (A) Catalytic hydrogenation in the presence of Lindlar's catalyst gives the trans isomer while reduction with one equivalent of lithium in liquid ammonia yields the cis isomer
   (B) Catalytic hydrogenation in the presence of Lindlar's catalyst gives the cis isomer while reduction with one equivalent of lithium in liquid ammonia yields the trans isomer
   (C) Reduction with one equivalent of lithium in liquid ammonia gives the cis isomer while reduction with excess sodium in liquid ammonia gives the trans isomer
   (D) Catalytic hydrogenation over palladium catalyst gives the trans isomer while catalytic hydrogenation over finely divided platinum yields the trans isomer.

88. Paraldehyde is the trimer of

   (A) Methanal
   (B) Glyoxal
   (C) Benzaldehyde
   (D) Ethanal

89. In Hunsdiecker reaction, silver salts of carboxylic acids react with a halogen to produce an organic halide. Since the reaction is successful on bridgehead positions as well, the most significant intermediate involved in this reaction is:
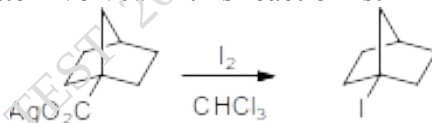
(A) carbocation
(B) carbene
(C) carbon centered free radical
(D) carbanion

90. Pick the statement that is not true for SN2 reactions

(A) SN2 reaction rates are unaffected by the nature of solvents
(B) SN2 reactions proceed with inversion of configuration at the reacting center.
(C) SN2 reaction rates are controlled by the nature of both leaving groups and nucleophiles
(D) Presence of electron withdrawing groups on the reacting center accelerates SN2 reaction rates

91. The following base-catalyzed cyclization reaction is an example for
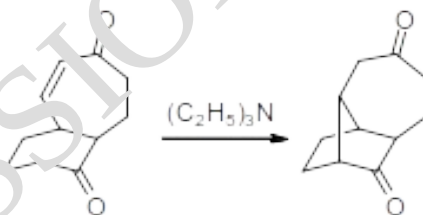
(A) aldol condensation
(B) Dieckmann condensation
(C) Nazarov cyclization
(D) Michael addition

92. Pick the reagent suitable for effecting the following ring expansion reaction:
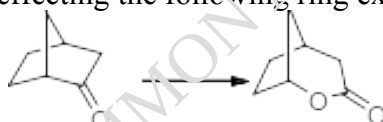
(A) concentrated nitric acid
(B) peroxytrifluoroacetic acid (CF_3CO_3H)
(C) periodic acid(HIO_4)
(D) osmium tetroxide

93. Pick the statement that is **not true** for Diels-Alder reactions

    (A) It is a suitable method for the preparation of six-membered rings having one or two double bonds
    (B) It is stereospecific in nature
    (C) It is a concerted 4+2 cycloaddition reaction
    (D) Diels Alder reactions are equally feasible under thermal and photochemical conditions

94. Which among the following reactions proceeds through an intermediate?

    (A) SN2 substitutions
    (B) E2 eliminations
    (C) Ring opening of cyclobutene to give 1,3-butadiene under thermal conditions
    (D) Rearrangement of phenyl acetate to give 4-hydroxyacetophenone

95. Which among the following reactions is not a suitable method for the preparation of benzaldehyde?

    (A) Oxidation of benzyl alcohol using PCC
    (B) Rosenmund reduction of benzoyl chloride
    (C) Reaction of phenylmagnesium bromide with carbon monoxide
    (D) Ozonolysis of styrene (vinylbenzene)

96. The following reaction is an example for
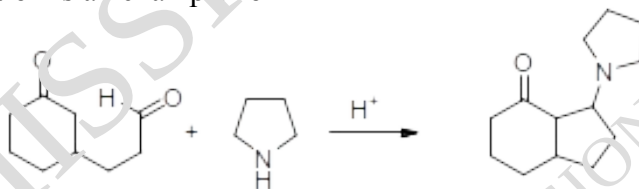
    (A) Claisen condensation
    (B) Knoevenagel reaction
    (C) Stobbe condensation
    (D) Mannich reaction

97. Which among the following reactions is not suitable for the preparation of cyclohexane-1,2-diol?

    (A) Oxidation of cyclohexene with osmium tetroxide
    (B) Treatment of cyclohexene oxide with aqueous NaOH
    (C) Treatment of cyclohexene oxide with Lewis acid such as boron trifluoride in nonaqueous media
    (D) Treatment of adipaldehyde with magnesium metal

98. The following ring contraction reaction is achieved by
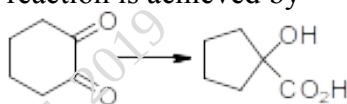
(A) a base such as hydroxide ion
(B) Lewis acids
(C) triphenylphosphine
(D) periodic acid

99. A ring opening polymerization is involved in the preparation of

(A) nylon-6,6
(B) nylon-6
(C) polyurethane
(D) polyurea

100. Which among the following will not give a positive test with Ninhydrin?

(A)

(B)

(C)

(D)
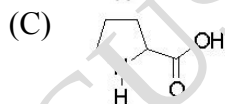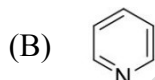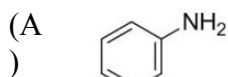
101. A solution whose pK_a is greater than pK_b is _____ in nature

(A) acidic
(B) neutral
(C) alkaline
(D) None of the above

102. The coagulation of 100 mL of a colloidal solution of gold number is completely prevented by the addition of 0.25 g of starch to it before adding 1 mL of 10% NaCl solution. Calculate the gold number of starch.

   (A) 50
   (B) 250
   (C) 25
   (D) 500

103. The coefficient of viscosity is expressed in units of

   (A) dynes sec cm^{-2}
   (B) dynes cm^{-2}
   (C) dynes sec cm^{-3}
   (D) dynes sec^{-1} cm^{-20}

104. A first order reaction has a rate constant of 0.005′ min^{-1}. If we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in the solution after 3 hours?

   (A) .05 M
   (B) 0.04 M
   (C) 0.03 M
   (D) 0.003 M

105. The internal energy of an ideal gas is ………. the volume at constant temperature.

   (A) independent of
   (B) proportional to
   (C) inversely proportional to
   (D) proportional to the square root of

106. In a reversible adiabatic expansion of a real gaseous system the temperature of the system

   (A) increases
   (B) decreases
   (C) remains the same
   (D) tends to 0K

107. The slope of the graph of log (a-x) versus time for the first order rate equation is

(A) $\dfrac{2.303}{k}$

(B) k

(C) −k

(D) $\dfrac{-k}{2.303}$

108. The rate of a gaseous reaction becomes half when volume of the vessel is doubled. What is the order of the reaction?

(A) 0
(B) 1
(C) 2
(D) 0.5

109. A perfectly ideal gas

(A) can be liquefied only below inversion temperature
(B) can be easily liquefied
(C) can be liquefied at low temperature
(D) cannot be liquefied

110. If v =300b, the reduced volume is

(A) 3
(B) 100
(C) 10
(D) 1/100

111. At 700 K the equilibrium constant K_p for the reaction $2SO_{3(g)} == 2SO_{2(g)} + O_{2(g)}$ is 1.8×10^{-3} kPa. What is the numerical value in moles per dm^3 of K_c for the reaction at the same temperature?

(A) 3.09×10^{-4} mol cm^{-3}
(B) 3.09×10^{-4} mol m^{-3}
(C) 3.09×10^{4} mol m^{-3}
(D) 3.09×10^{-7} mol m^{-3}

112. Half-life of a second order reaction is given by

    (A) $1/k_a$
    (B) $0.693/k_a$
    (C) $2.303/k_a$
    (D) $k_a/2.303$

113. The order of a reaction with rate $=\dfrac{k\,C_A^{\frac{3}{2}}}{\sqrt{C_B}}$ is

    (A) 2
    (B) 3/2
    (C) 1
    (D) 1/2

114. In the reaction $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$, NH_3 is considered as

    (A) Arrhenius base
    (B) Lowry Bronsted base
    (C) Lewis base
    (D) Conjugate base

115. Radioactive disintegration of the substance is an example of a ……… order reaction

    (A) 0
    (B) 1
    (C) 2
    (D) fractional

116. The addition of ……… to a colloidal solution causes flocculation

    (A) an acid
    (B) a surfactant
    (C) an electrolyte
    (D) an alkali

117. Which among the following is an example for hydrophilic sols

    (A) gum
    (B) starch
    (C) starch and gum
    (D) None of the above

118. The H^+ ion concentration of a weak monobasic acid of concentration 'C' is given by

    (A) $K_a C^{1/2}$

    (B) C

    (C) $\sqrt{K_a C}$

    (D) K_a / C

119. The ionic product of water at 50°C is 4×10^{-14}. The concentration of H^+ ion is

    (A) 2×10^7 moles /litre
    (B) 2×10^{-7} moles /litre
    (C) 10^{-7} moles /litre
    (D) 10^{+7} moles /litre

120. The expression for pH of acetic acid - sodium acetate buffer solution is

    (A) $pH = pk_a + \log_{10} \dfrac{[sodium\,acetate]}{[acetic\,acid]}$

    (B) $pH = pk_a + \log_{10}$

    (C) $pH = 0$

    (D) $pH = pk_a + n\log_{10} \dfrac{[sodium\,acetate]}{[acetic\,acid]}$

121. Precipitation occurs only when the product of ionic concentrations

    (A) exceeds the solubility product
    (B) is lesser than solubility product
    (C) is equal to the solubility product
    (D) is lesser than viscosity of the solution

122. Movement of colloidal particles under the influence of electric field is called

    (A) Electrophoresis
    (B) Brownian movement
    (C) Flocculation
    (D) Tyndal effect

123. Schulz Hardy rule is concerned with

    (A) Brownian movement in colloids

(B) Coagulation of sols by electrolytes
(C) Protecting power of hydrophilic sols
(D) Cohesive forces

124. The expression for the average velocity is given by

(A) $\hat{C}=\sqrt{\dfrac{3\,RT}{M}}$

(B) $\hat{C}=\sqrt{\dfrac{RT}{\pi M}}$

(C) $\hat{C}=\sqrt{\dfrac{2\,kT}{M}}$

(D) $\hat{C}=\sqrt{\dfrac{8\,kT}{\pi m}}$

125. For an isothermal process of an ideal gas ΔH is

(A) less than zero

(B) greater than zero

(C) zero

(D) $P\Delta V$

126. In a consecutive reaction of the type $A\xrightarrow{k_1}B\xrightarrow{k_2}C$ if $k_2 \gg k_1$ the formation of C takes place without time lag. This statement

(A) is true
(B) can't be predicted
(C) is false
(D) is true below room temperature only

127. The efficiency of heat engines is given by $(T_2 > T_1)$

(A) $E=\dfrac{T_2-T_1}{T_1}$

(B) $E=\dfrac{T_2-T_1}{T_2}$

(C) $E = \dfrac{T_2}{T_2 - T_1}$

(D) $E = \dfrac{T_1 - T_2}{T_2}$

128. Two gases have molecular masses 64 and 100 respectively. The diffusion rate for the former is 15 mLs^{-1}. What is the diffusion rate for the other?

   (A) 12 L s^{-1}
   (B) 1.2 mL s^{-1}
   (C) 12 μL s^{-1}
   (D) 12 mL s^{-1}

129. According to kinetic theory of gases, for a diatomic molecule

   (A) the pressure exerted by the gas is proportional to the mean velocity of the molecule
   (B) the pressure exerted by the gas is proportional to the root mean velocity of the molecule
   (C) the root mean square velocity of the molecule is inversely proportional to the temperature
   (D) the mean translation kinetic energy of the molecule is proportional to the absolute temperature

130. The value α (degree of dissociation) for 0.05 N acetic acid is 0.03. Calculate the dissociation constant for acetic acid

   (A) 1.55×10^{-3}
   (B) 9.28×10^{-4}
   (C) 4.64×10^{-5}
   (D) 5.73×10^{-2}

131. Calculate the solubility product of compound AB$_2$ (molar mass = 400) if at 25°C it requires 0.08 g of A to form its 1 litre saturated solution

   (A) 8.0×10^{-4}
   (B) $2.05 \times 10^{-}$
   (C) 2.05×10^{-12}
   (D) 3.2×10^{-11}

132. Calculate the degree of hydrolysis of 0.1 N KCN solution at 25°C. (The dissociation constant of HCN is 5.0×10^{-5} and ionic product of water is 1.0×10^{-14})

   (A) 2.0×10^{-9}
   (B) 0.2×10^{9}
   (C) 3.16×10^{-5}
   (D) 3.16×10^{-3}

133. When $[N_2O_5] = 0.22$ M the rate of decomposition of N_2O_5 is 1.1×10^{-4} mol $L^{-1} s^{-1}$. What is the value of k for this first order reaction?

(A) $1.1 \times 10^{-3} s^{-1}$
(B) $5 \times 10^{-4} min$
(C) $5 \times 10^{-4} s^{-1}$
(D) $5 \times 10^{-3} s^{-1}$

134. For an elementary reaction $2A + B \rightleftharpoons 3C$ the rate of appearance of C at time 't' is 1.3×10^{-4} mol $L^{-1} s^{-1}$. Calculate the rate of disappearance of A at this time

(A) 8.67×10^{-5} mol $L^{-1} s^{-1}$
(B) 2.6×10^{-5} mol $L^{-1} s^{-1}$
(C) 3.9×10^{-5} mol $L^{-1} s^{-1}$
(D) 6.5×10^{-5} mol $L^{-1} s^{-1}$

135. In the Arrhenius equation for a certain reaction, the value of A and E_a (activation energy) are $4.0 \times 10^{10} s^{-1}$ and 80 kJ mol^{-1} respectively. If the reaction is of first order, calculate the temperature at which the rate constant becomes $1.2 \times 10^{-3} s^{-1}$.

(A) 256.21 K
(B) 269.16 K
(C) 2.69°C
(D) 276.56 K

136. In the cell $Zn/Zn^{2+}(0.01$ M$) // Ag (1.0$ M$)/ Ag$. Calculate EMF of the cell at 25°C if $E^o_{cell} = 1.50$ at 25°C

(A) 1.259
(B) 2.559
(C) 1.559
(D) 0.155

137. Smoke is an example of

(A) gas dispersed in solid
(B) gas dispersed in liquid
(C) liquid dispersed in solid
(D) solid dispersed in gas

138. 8.5 J heat flow out into the surroundings when a sample of a gas contracts 400 mL by an average pressure of 0.5 atm. Calculate the work done

   (A) 2.02 kJ
   (B) 20.26 kJ
   (C) 20.26 J
   (D) 2.02 kJ mol^{-1}

139. Calculate the standard heat of formation of carbon disulphide$_{(l)}$. Given that the standard heat of combustion of carbon $_{(s)}$, sulphur $_{(s)}$ and carbon disulphide $_{(l)}$ are −333.. 22..2 and −111.1 kJ mol^{-1} respectively.

   (A) 404.4 kJ mol^{-1}
   (B) 244.4 kJ mol^{-1}
   (C) 4.04 kJ mol^{-1}
   (D) −444.4 kJ mol^{-1}

140. The value of standard state free energy for the reaction $CO_{(g)} + H_2O_{(g)} \leftrightarrow CO_2 + H_{2(g)}$ at 25°C is 6.66 kcal. Calculate the value of equilibrium constant k_p (R=1.987 cal deg^{-1} mole^{-1})

   (A) 13×10^{-5}
   (B) 1.3×10^{-5}
   (C) 1.3×10^{-7}
   (D) 0.3×10^{-7}

141. Enthalpy change (ΔH_{vap}) for the transition of liquid water to steam at 100 °C is 74. kJ mol^{-1}. Calculate the entropy change for this purpose

   (A) 20 J mol^{-1} K^{-1}
   (B) 0.5 kJ mol^{-1} K^{-1}
   (C) 200 J mol^{-1} K^{-1}
   (D) 2.0 J mol^{-1} K^{-1}

142. For an adiabatic process which of the following is correct

   (A) q = 0
   (B) q = +w
   (C) ΔE = q
   (D) ΔH = 0

143. For rhombohedral crystal system

    (A) a = b = c , all angles = 90°
    (B) a=b=c , all angles are equal but not equal to 90°
    (C) a ≠ b ≠ c , all angles are different and not equal to 90°
    (D) a ≠ b ≠ c , all angles = 90°

144. A compound formed by elements A and B crystallises in the cubic arrangement in which A atoms are at the corners of a cube and B atoms are at the face centres. What is the formula of the compound?

    (A) A_3B
    (B) AB
    (C) AB_3
    (D) A_2B_3

145. Aluminium crystallizes in an fcc structure. Atomic radius of the metal is 125 pm. Calculate the edge length of the unit cell of the metal?

    (A) 353.3 nm
    (B) 4.28 pm
    (C) 2.828 nm
    (D) 3.147 nm

146. The radius of Na^+ ion is 95 pm and that of Cl^- ion is 181 pm. Predict the coordination number of Na^+ ion

    (A) 4
    (B) 8
    (C) 6
    (D) 12

147. An element having bcc geometry has atomic mass 50 u. Calculate the density of the unit cell, if its edge length is 290 pm

    (A) 5.75 g cm^{-3}
    (B) 6.81×10^{-13} kg m^{-3}
    (C) 6810 kg m^{-3}
    (D) 6.81 g cm^{-3}

148. What is the effect of presence of Schottky defects on the density of the crystal?

    (A) The substance may start melting even at room temperature
    (B) The number of cations and anions become equal
    (C) The number of anions decreases
    (D) The overall density of a crystalline substance decreases due to Schottky defects

149. Close packing is maximum in the crystal, which is

    (A) fcc
    (B) simple cubic
    (C) bcc
    (D) monoelinic

150. The equivalent conductivity of NH_4Cl at infinite dilution is 120 ohm^{-1} cm^2 $equiv^{-1}$ and ionic conductance at OH^- and Cl^- ions are 180 and 60 ohm^{-1} cm^2 $equiv^{-1}$ respectively at 25°C. Calculate the equivalent conductivity of NH_4OH at infinite dilution

    (A) 220 ohm^{-1} cm^2 $equiv^{-1}$
    (B) 235 ohm^{-1} cm^{-2} $equiv^{-1}$
    (C) 440 ohm cm^2 $equiv^{-1}$
    (D) 240 ohm^{-1} cm^2 $equiv^{-1}$

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CHEMISTRY PG - ANSWER KEY

TEST CODE: 604

QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY
1	A	26	C	51	A	76	D	101	C
2	A	27	D	52	C	77	D	102	C
3	C	28	D	53	C	78	B	103	A
4	D	29	D	54	B	79	A	104	B
5	C	30	A	55	B	80	C	105	A
6	C	31	B	56	D	81	C	106	B
7	C	32	B	57	C	82	A	107	D
8	A	33	A	58	A	83	A	108	B
9	C	34	D	59	C	84	B	109	D
10	C	35	B	60	C	85	D	110	B
11	B	36	C	61	A	86	D	111	B
12	B	37	B	62	D	87	B	112	A
13	A	38	C	63	D	88	D	113	C
14	B	39	C	64	B	89	C	114	B
15	A	40	C	65	A	90	A	115	B
16	D	41	D	66	B	91	D	116	C
17	A	42	C	67	C	92	B	117	C
18	C	43	A	68	C	93	D	118	A
19	C	44	C	69	A	94	D	119	B
20	D	45	A	70	A	95	C	120	A
21	B	46	D	71	D	96	D	121	A
22	A	47	A	72	B	97	C	122	A
23	C	48	A	73	B	98	A	123	B
24	D	49	C	74	C	99	B	124	D
25	C	50	D	75	A	100	B	125	C

QN. NO.	KEY
126	A
127	B
128	D
129	D
130	C
131	D
132	C
133	C
134	A
135	B
136	C
137	D
138	C
139	D
140	B
141	C
142	A
143	B
144	C
145	A
146	C
147	D
148	D
149	A
150	D