P.G. ENTRANCE EXAMINATION, APRIL 2022

APPLIED CHEMISTRY/CHEMISTRY (NANO SCIENCE)

Time : Two Hours Maximum : 400 Marks

Each question carries 4 marks.
1 mark will be deducted for each wrong answer.

1. The complex with the most intense colour among the following is :

   (A) $[FeF_6]^{3-}$. (B) $[MnCl_4]^{2-}$.

   (C) $[CoCl_6]^{2-}$. (D) $[CoF_6]^{3-}$.

2. The atomic structure model in which electrons revolve around nucleus in orbits with definite amount of energy is given by :

   (A) Ernest Rutherford. (B) Neils Bohr.

   (C) Robert A. Millikan. (D) Eugen Goldstein.

3. Which of the following chemicals is also known as "butter of tin" ?

   (A) Stannic chloride. (B) Sodium perborate.

   (C) Potassium nitrate. (D) Magnesium hydroxide.

4. The vapor pressure of a solution containing a non-volatile solute is directly proportional to the :

   (A) Molality of the solvent. (B) Molality of the solvent.

   (C) Molarity of the solvent. (D) Molarity of the solvent.

5. In voltaic cells, the salt bridge :

   (A) Is not necessary in order for the cell to work.

   (B) Acts as a mechanism to allow mechanical mixing of the solutions.

   (C) Allows charge balance to be maintained in the cell.

   (D) Drives free electrons from one half-cell to the other.

6. Which component is used to harden the rubber in the vulcanization process ?

(A) Nitrogen. (B) Sulphur.

(C) Silicon. (D) Alcohol.

7. Lanthanoid contraction is caused due to :

(A) The appreciable shielding on outer electrons by 4f electrons from the nuclear charge.

(B) The appreciable shielding on outer electrons by 5d electrons from the nuclear charge.

(C) The same effective nuclear charge from Ce to Lu.

(D) The imperfect shielding on outer electrons by 4f electrons from the nuclear charge.

8. Which among the following qualities of iron ore is best based upon iron content ?

(A) Magnetite. (B) Hematite.

(C) Limonite. (D) Siderite.

9. Which of the following chemicals is also known as "Chinese snow" ?

(A) Silver iodide. (B) Potassium nitrate.

(C) Ammonium chloride. (D) Sodium phosphate.

10. Water gas is a mixture of :

(A) Carbon monoxide and water. (B) Carbon dioxide and water.

(C) Carbon monoxide and hydrogen. (D) Carbon dioxide and hydrogen.

11. The hemihydrate of calcium sulphate commonly known as :

(A) Gypsum. (B) Cement.

(C) Limestone. (D) Plaster of Paris.

12. The Tyndall effect is the :

(A) Scattering of a beam of light by the particles of a suspension.

(B) Refraction of a beam of light by the particles of a solution.

(C) Scattering of a beam of light by the particles of a colloid.

(D) Reflection of a beam of light by particles of a suspension.

13. Which of the following is correct about effective nuclear charge experienced by the orbital ?

(A) It decreases with increase of azimuthal quantum number.

(B) It increases with increase of azimuthal quantum number.

(C) It increases with increase of magnetic quantum number.

(D) It is same everywhere.

14. Which of these principles state that in the ground state of the atoms, the orbitals are filled in order of their increasing energies ?

(A) Hund's rule.

(B) Afbau principle.

(C) Bohr Theory.

(D) Pauli's exclusion principle.

15. What is the relationship between Becquerel and Curie unit ?

(A) 1 curie = 0.5 Bq.

(B) 1 curie = 9×10^6 Bq.

(C) 1 curie = 3.7×10^{10} Bq.

(D) 1 curie = 5.7 Bq.

16. What is the structure of IF_7 ?

(A) Triagonal bipyramid.

(B) Pentagonal bipyramid.

(C) Square pyramid.

(D) Tetrahedral.

17. What do we call the molar conductivity when the concentration approaches zero ?

(A) Reacting molar conductivity.

(B) Zero level molar conductivity.

(C) Limiting molar conductivity.

(D) Ideal molar conductivity.

18. Hydrogen bomb is based on the principle of ———.

(A) Nuclear fission.

(B) Nuclear fusion.

(C) Natural radioactivity.

(D) Artificial radioactivity.

19. Gold and silver are extracted from their respective ores by :

(A) Hydro metallurgy.

(B) Roasting.

(C) Smelting.

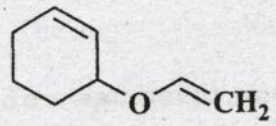
(D) Leaching.

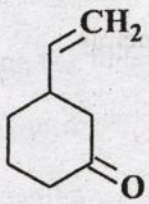
20. What is the order of the reaction which is independent of the concentration of reactants ?

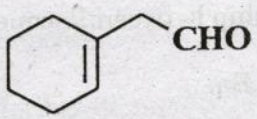
(A) Third order. (B) Second order.

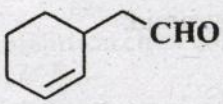
(C) First order. (D) Zero order.

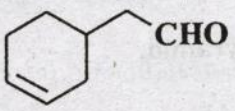
21. Thermal rearrangement of the following compound will give :



(A) 

(B) 

(C) 

(D) 

22. The enzyme that converts glucose to ethyl alcohol is :

(A) Maltase. (B) Zymase.

(C) Diastase. (D) Nvertase.

23. Cobalt - 60 is commonly used in radiation therapy because it emits :

(A) Alpha - rays. (B) Beta rays.

(C) Gamma rays. (D) X - rays.

24. The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of 10 dm^3 at 27°C is to a volume of 100 dm^3 is :

(A) 42.3 J/mole/K. (B) 32.3 J/mole/K.

(C) 35.8 J/mole/K. (D) 38.3 J/mole/K.

25. Natural rubber is a polymer of :

(A) Isoprene. (B) Butadiene.

(C) Ethylene. (D) 2-methyl-1,3-butadiene.

26. Which of the following is the strongest acid ?

(A) ICH_2COOH. (B) $BrCH_2COOH$.

(C) FCH_2COOH. (D) $ClCH_2COOH$.

27. The metal which reacts most violently with cold water is :

(A) Calcium. (B) Sodium.

(C) Magnesium. (D) Potassium.

28. Which one of the following is used to induce artificial rain ?

(A) Calcium carbonate. (B) Silver Iodide.

(C) Potassium Nitrate. (D) Ammonium chloride.

29. Which of the following acts both as oxidising and reducing agent ?

(A) Nitric acid. (B) Nitrogen peroxide.

(C) Nitrous acid. (D) Ammonia.

30. Brass gets discoloured in air because of the presence of which of the following gases in air ?

(A) Hydrogen sulphide. (B) Oxygen.

(C) Nitrogen. (D) Carbon dioxide.

31. What will be the reactivity of chlorobenzene in an electrophilic substitution reaction with benzene ?

(A) Reacts very slowly than benzene.

(B) Reacts in the same way as benzene.

(C) Reacts faster than benzene.

(D) Does not react with benzene.

32. What is the main difference between Hofmann and Curtius rearrangement ?

(A) Products are different. (B) Intermediate formed is different.

(C) Reactants are different. (D) Isomers.

33. Which Intermediate is formed in Wolffs reaction ?

(A) Carbene. (B) Ketene.

(C) Carbocation. (D) Carbanion.

34. The pH of a 1×10^{-8} M HCL is close to :

(A) 8.0. (B) 7.1.

(C) 6.0. (D) 6.9.

35. Electrons movement take place from :

(A) Positively to negatively components.

(B) Negatively to positively charged components.

(C) Neutral to charged species.

(D) Charged species to neutral.

36. Isopropyl methyl ether when treated with cold hydrogen iodide gives which of the following alcohol ?

(A) Isopropyl alcohol and methyl iodide.

(B) Isopropyl iodide and methyl iodide.

(C) Isopropyl alcohol and methyl alcohol.

(D) Isopropyl iodide and methyl alcohol.

37. Which one is the correct order of reactivity of different types of alcohol towards hydrogen halide ?

(A) 3° alcohol > 2° alcohol >1° alcohol.

(B) 3° alcohol > 1° alcohol > 2° alcohol.

(C) 2° alcohol >1° alcohol >3° alcohol.

(D) 1° alcohol > 2° alcohol >3° alcohol.

38. On heating aqueous solution of benzene diazonium chloride, which of the following is formed ?

(A) Benzene. (B) Chlorobenzene.

(C) Phenol. (D) Aniline.

39. Which of the following gases when passed through warm dilute solution of H_2SO_4 in presence of $HgSO_4$ gives acetaldehyde ?

(A) C_3H_6. (B) C_2H_6.

(C) C_2H_4. (D) C_2H_2.

40. During a reaction of Tollen's test, the formation of mirror inside the tube is due to :

(A) Silver ions. (B) Silver atoms.

(C) Silver acetate. (D) Silver nitrate.

41. The maximum number of phases that can co-exist in equilibrium for a one component system is :

(A) 1. (B) 2.

(C) 3. (D) 4.

42. The synthesis of which of the following polymers involves the repeated loss of small molecules ?

(A) Polythene. (B) Buna-S.

(C) Nylon-6, 6. (D) Buna-N.

43. Which of the following is a co-polymer ?

(A) Polythene. (B) Bakelite.

(C) PVC. (D) Polyacrylonitrile.

44. Why are aryl halides less reactive towards nucleophilic substitution reactions as compared to alkyl halides ?

(A) Longer carbon halogen bond.

(B) The inductive effect.

(C) The formation of a less stable carbanion.

(D) Sp^2-hybridized carbon attached to the halogen.

45. A non-volatile solid is added to water. Its boiling point will :

(A) Increase. (B) Decrease.

(C) No change. (D) Can't be predicted.

46. The condition of excess intake of vitamins is called :

(A) Denaturation. (B) Renaturation.

(C) Hypervitaminoses. (D) Avitaminoses.

47. Hormones are :

(A) Messengers. (B) Catalysts.

(C) Inhibitors. (D) Enzymes.

48. The reaction between benzenediazonium chloride and phenol results in a ——— coloured compound.

(A) Yellow. (B) Orange.

(C) Red. (D) Purple.

49. What is the catalyst used in the hydrogenation of acetyl chloride to produce ethanal ?

(A) Pt over $BaSO_4$. (B) Pt over $CuSO_4$.

(C) Pd over $BaSO_4$. (D) Pd over $CuSO_4$.

50. Friedel-Crafts benzoylation of benzene gives :

(A) Acetophenone. (B) Propiophenone.

(C) Benzophenone. (D) No reaction.

51. How many grams of NaOH would be required to neutralize all the acid in 75.0 mL of 0.0900 N H_2SO_4 ?

(A) 0.540 g. (B) 0.270 g.

(C) 1.32 g. (D) 0.660 g.

52. Which of the following disaccharides gives two same monosaccharide units on hydrolysis ?

(A) Maltose. (B) Lactulose.

(C) Lactose. (D) Sucrose.

53. Which of the following amines will form a product that is soluble in KOH, on reaction with Hinsberg's reagent ?

(A) Diethylamine. (B) N, N-Dimethylaniline.

(C) N, N-Dimethylpropylamine. (D) Isopropylamine.

54. The compressibility factor for ideal gas is :

(A) Zero. (B) 1.

(C) > 1. (D) < 1.

55. Which of the following is a product formed in Claisen condensation ?

(A) β-ester. (B) β-ketone.

(C) β-keto ester. (D) γ-diketone.

56. Which of the will give effective reduction of 3-hexyne to trans-3-hexene ?

(A) H_2/Lindlar's catalyst. (B) Na/liq. NH_3.

(C) Fe/NaCl. (D) DIBAL.

57. The process of heating the concentrated ore in a limited supply of air or in the absence of air is known as :

(A) Roasting. (B) Leaching.

(C) Calcination. (D) Cupellation.

58. What is formed when benzoic acid undergoes nitration in the presence of conc. HNO_3 and conc. H_2SO_4 ?

(A) o-Nitrobenzoic acid. (B) m-Nitrobenzoic acid.

(C) p-Nitrobenzoic acid. (D) 3, 5-Dinitrobenzoic acid.

59. Highest percentage of nitrogen is found in which among the following fertilizers among the given options ?

(A) Calcium ammonium nitrate. (B) Ammonium nitrate.

(C) Calcium nitrate. (D) Urea.

60. For a particle in a cubic box, the total number of quantum numbers needed to specify the states are :

(A) 1. (B) 2.

(C) 3. (D) 9.

61. Which among the following is a common salt in Detergents ?

(A) Sulphate. (B) Nitrate.

(C) Sulphonate. (D) Carbonate.

62. Which of the following is known as Jones reagent ?

(A) $KMnO_4$ in alkaline medium. (B) $KMnO_4$ in H_2SO_4.

(C) $K_2Cr_2O_7$ in acidic medium. (D) CrO_3 in H_2SO_4.

63. Which one of the following complexes can exhibit geometrical isomerism ?

(A) $[Pt\ (NH_3)_2\ Cl_2]$ (square planar).

(B) $[Zn\ (NH_3)_2Cl_2]$ (tetrahedral).

(C) $[Cu\ (NH_3)_4]^{2+}$ (square planar).

(D) $[Co\ (NH_3)_5Cl]^{2+}$ (octahedral).

64. An S_N1 reaction results in :

(A) Retention. (B) Racemisation.

(C) Inversion. (D) Elimination.

65. The heat of vaporization of freon, CCl_2F_2, is 17.2 kJ/mol at 25°C. What is the change of entropy for one mole of liquid freon when it vaporizes at 25°C ?

(A) 57.7 J/K. (B) 0.688 J/K.

(C) 5.13 × 103 kJ/K. (D) 3.16 J/K.

66. Corrundum and Cryolite are important ores of which of the following metal :

(A) Gold. (B) Silver.

(C) Tin. (D) Aluminium.

67. Catalyst $SnCl_2$/HCl is used in which of the following method of synthesis of aldehyde ?

(A) Stephen's reduction. (B) MPV reduction.

(C) Clemmensen's reduction. (D) Rosenmund's reduction.

68. Hypotonic solution is a solution :

(A) Whose osmotic pressure is less than that of another.

(B) Which can dissolve maximum amount of solute.

(C) Of solid in gas.

(D) Of solid in solid.

69. Diamond is harder than graphite because of :

(A) Its purity of atoms.

(B) Difference of layers.

(C) Difference in crystalline structure.

(D) Tetrahedral structure of diamond.

70. Select the correct IUPAC name for : $[FeF4(OH_2)2]^-$:

(A) Diaquatetrafluoroiron (III) ion.

(B) Diaquatetrafluoroferrate (III) ion.

(C) Diaquatetrafluoroiron (I) ion.

(D) Diaquatetrafluoroferrate (I) ion.

71. For one mole of gas Cp and Cv relations are :

(A) Cp = Cv. (B) Cp = Cv – R.

(C) Cp = Cv + R. (D) Cp = Cv · R.

72. The suitable indicator for the titration of sodium carbonate with sulfuric acid is :

(A) Methyl orange. (B) Methyl red.

(C) Methyl blue. (D) Phenolphthalein.

73. Quartz is made from :

(A) Calcium sulfate. (B) Calcium silicate.

(C) Sodium sulfate. (D) Sodium silicate.

74. In the Rosenmund's reduction, $BaSO_4$ taken with catalyst Pd acts as which of the following ?

(A) Promotor. (B) Catalytic poison.

(C) Co-operator. (D) Absorber.

75. How many faradays are required to reduce 1.00 g of aluminum (III) to the aluminum metal ?

(A) 1.00. (B) 1.50.

(C) 0.111. (D) 3.00.

76. Which one of the following violates the octet rule ?

(A) CBr_4. (B) AsF_5.

(C) NF_3. (D) PCl_3.

77. The half-life for a first-order reaction is 32 *s*. What was the original concentration if, after 2.0 minutes, the reactant concentration is 0.062 M ?

(A) 0.84 M. (B) 1.68 M.

(C) 8.4 M. (D) 0.42 M.

78. In any cubic lattice, an atom lying at the corner of a unit cell is shared equally by how many unit cells ?

(A) One. (B) Two.

(C) Four. (D) Eight.

79. When the concentration of reactant molecules is increased, the rate of reaction increases. The best explanation is: As the reactant concentration increases, the :

(A) Average kinetic energy of molecules increases.

(B) Frequency of molecular collisions increases.

(C) Rate constant increases.

(D) Activation energy increases.

80. What type of inter-particle forces holds liquid N_2 together ?

(A) Covalent bonding. (B) Hydrogen bonding.

(C) London forces. (D) Dipole-dipole interaction.

81. What is the stress known as when there is a relative displacement between various layers of solid ?

(A) Tangential. (B) Linear.

(C) Lateral. (D) Longitudinal.

82. Which of the following element has the highest first ionization enthalpy ?

(A) Magnesium. (B) Strontium.

(C) Beryllium. (D) Barium.

83. Which of the following refining methods works on the principle those impurities are more soluble in the melt than in the solid state of the metal ?

(A) Liquation. (B) Electrolytic refining.

(C) Zone refining. (D) Vapour Phase refining.

84. What is the chemical name of Bleaching powder ?

(A) Calcium Oxychloride. (B) Calcium Monosulphate.

(C) Calcium Tetrachloride. (D) Sodium chloride.

85. Which of the following metal finds its use as a radiocontrast agent in X-ray imaging ?

(A) Scandium. (B) Lithium.

(C) Barium. (D) Titanium.

86. Which allotrope of Phosphorous is used for creating smoke bombs ?

(A) White Phosphorous. (B) Red Phosphorous.

(C) Black Phosphorous. (D) All allotropes.

87. Which of the following is a natural dye ?

(A) Crystal violet. (B) Aniline blue.

(C) Alizarin. (D) Phenolphthalein.

88. Which material is used in the making of the "Solar Cells" ?

(A) Tin. (B) Thallium.

(C) Cesium. (D) Silicon.

89. It is believed that carbon-14 in nature is slowly generated by the action of :

(A) Protons on carbon-12. (B) Electrons on hydrogen.

(C) Cosmic rays on boron. (D) Neutrons on nitrogen.

90. Solids may be considered to be either crystalline non-crystalline. The basic difference between them is that a crystal, in contrast to a non-crystal.

(A) Has a sharp melting point.

(B) Exhibits double refraction.

(C) Has a completely regular atomic or molecular structure.

(D) Has an irregular array of atoms.

91. The hydrolysis of a fat using a solution of a strong hydroxide is called :

(A) Neutralization. (B) Esterification.

(C) Saponification. (D) Condensation.

92. What is the name given to the non-superimposable mirror image forms of chiral compounds ?

(A) Diasteriomers. (B) Enantiomers.

(C) Mesomers. (D) Epimers.

93. Under similar conditions, which of the following is the best reducing agent ?

(A) Iodide ion. (B) Bromide ion.

(C) Chloride ion. (D) Fluoride ion.

94. Normality is defined as the number of :

(A) Moles of solute per 1000 grams of solvent.

(B) Moles of solute per 1000 grams of solution.

(C) Equivalent weights of solute per 1000 grams of solution.

(D) Equivalent weights of solute per liter of solution.

95. In a flame test, the presence of copper in a solution is evident by ——— colour.

(A) Orange. (B) Red.

(C) Blue-green. (D) Indigo.

96. During osmosis :

(A) Pure solutes diffuse through a membrane but solvent does not.

(B) Pure solvent diffuses through a membrane but solutes do not.

(C) Pure solvent and a solution both diffuse at the same time through a membrane.

(D) Gases diffuse through a membrane into a solution and build up pressure.

97. Crude oil is separated into its components by :

(A) Simple distillation. (B) Fractional distillation.

(C) Chemical reaction. (D) Chromatography.

98. The law of conservation of mass was first stated by :

(A) Dalton. (B) Boyle.

(C) Charles. (D) Lavoisier.

99. The loss of water of crystallization from a hydrate when exposed to air is termed as :

(A) Efflorescence. (B) Deliquescence.

(C) Quiescence. (D) Anhydrogenation.

100. The indicator phenolphthalein changes colour at pH -9.0. This indicator is not suitable for accurate determination of the end point in the titration of :

(A) CH_3COOH with NaOH. (B) HCl with NH_4OH.

(C) HCl with NaOH. (D) HCl with KOH.