

PG/INTEGRATED PG ENTRANCE EXAMINATION, APRIL 2023

APPLIED CHEMISTRY/CHEMISTRY (NANO SCIENCE)

Time : Two Hours

Maximum : 400 Marks

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

1. Born Lande equation is used to calculate _____.
[A] Lattice energy. [B] Electron affinity.
[C] Electronegativity. [D] Bond length.
2. AlCl_3 is in solid-state has a _____ structure.
[A] Body centered. [B] Face centered.
[C] Cubic close-packed. [D] Hexagonal.
3. Among the four oxychloro acids the highest acid strength is for :
[A] HClO_4 . [B] HClO_2 .
[C] HClO_3 . [D] HOCl .
4. Emission of which one of the following leaves both atomic number and mass number unchanged ?
[A] Neutron. [B] Beta particle.
[C] Positron. [D] Gamma radiation.
5. Which element has the most stable isotope ?
[A] Cobalt. [B] Barium.
[C] Aluminium. [D] Lead.
6. The Born-Oppenheimer Approximation is the assumption that the electronic motion and the _____ in molecules can be separated :
[A] Nuclear motion. [B] Vibrational motion.
[C] Thermal motion. [D] Translational motion.

Turn over

7. According to the _____, Electrons in a molecule occupy atomic orbitals rather than molecular orbitals.
- [A] Metallic theory. [B] Band theory.
[C] Valence bond theory. [D] Molecular orbital theory.
8. The shape of sp^2 hybridized molecule is _____.
- [A] Tetrahedral. [B] Planar.
[C] Hexagonal. [D] Linear.
9. The _____ is defined as the average rate at which two reactants collide in the given system.
- [A] Collision index. [B] Collision number.
[C] Collision speed. [D] Collision frequency.
10. The enthalpy change in a reaction does not depend upon the _____.
- [A] Initial and final enthalpy of the reaction.
[B] Different intermediate steps in the reaction.
[C] State of reactions and products.
[D] Nature of the reactants and products.
11. Carnot cycle consists of _____.
- [A] Two constant volume and two reversible adiabatic processes.
[B] One constant volume, one constant pressure and two reversible adiabatic processes.
[C] Two constant pressure and two reversible adiabatic processes.
[D] Two isothermal and two reversible adiabatic processes.
12. The enthalpy of dry saturated steam _____ with the increase in pressure.
- [A] Become zero. [B] Remains constant.
[C] Decreases. [D] Increases.
13. When 1kg of water at 373 K is converted into steam how much amount of heat required ?
- [A] 2260 KJ. [B] 22600 KJ.
[C] 226 KJ. [D] 22.6 KJ.

14. The _____ law of thermodynamics states that the entropy of a system approaches a constant value as the temperature approaches absolute zero.
- [A] Zeroth. [B] Third.
[C] First. [D] Second.
15. Ferric alum is :
- [A] $KAl(SO_4)_2 \cdot 12H_2O$. [B] $NH_4Fe(SO_4)_2 \cdot 12H_2O$.
[C] $NH_4Al(SO_4)_2 \cdot 12H_2O$. [D] $NaFe(SO_4)_2 \cdot 12H_2O$.
16. Which of the following is soluble in yellow ammonium sulphide ?
- [A] CuS . [B] CdS .
[C] PbS . [D] SnS .
17. In a qualitative inorganic analysis of basic radicals, HCl is preferred to HNO_3 , for preparing a solution of given substance. This is because _____.
- [A] Nitric acid is difficult to handle.
[B] Nitrates are not decomposed to sulphides.
[C] Hydrochloric acid is not an oxidizing agent.
[D] Chlorides are easily converted to sulphides.
18. _____ extract is used for the determination of water insoluble anions in inorganic analysis.
- [A] Na_2CO_3 . [B] K_2CO_3 .
[C] $MgCO_3$. [D] $CaCO_3$.
19. Which of the following metals cannot be obtained by reduction of its metal oxide by aluminium ?
- [A] Cr . [B] Mn .
[C] Mg . [D] Fe .
20. Bronze is _____.
- [A] 50 % copper and 50 % tin. [B] 88 % copper and 12 % tin.
[C] 50 % copper and 50 % zinc. [D] 50 % copper, 25 % tin and 25 % zinc.

Turn over

21. The structure of IF_5 , is _____.
- [A] T-shaped. [B] Pyramidal.
[C] Square pyramidal. [D] Pentagonal bipyramidal.
22. Which of the following halogen does not exhibit positive oxidation states in its compounds ?
- [A] Fluorine. [B] Chlorine.
[C] Iodine. [D] Bromine.
23. Which among the following noble gases does not form clathrates ?
- [A] Xenon. [B] Krypton.
[C] Argon. [D] Helium.
24. On increasing temperature, the viscosity of polysiloxanes _____.
- [A] Decreases. [B] Remains constant.
[C] Increases. [D] First increase and then decrease.
25. The Bhopal gas tragedy was occurred during _____.
- [A] 2-3 December 1985. [B] 2-3 November 1984.
[C] 2-3 November 1985. [D] 2-3 December 1984.
26. The result of the ozone hole is _____.
- [A] Global warming. [B] UV radiation.
[C] Acid rain [D] Greenhouse effect
27. COD/BOD ratio of fresh water is _____.
- [A] 1. [B] 0 - 1.
[C] 0. [D] Above 1.
28. The main cause of the permanent hardness of water is :
- [A] Magnesium carbonate. [B] Magnesium sulphate.
[C] Calcium sulphate. [D] Magnesium chloride.

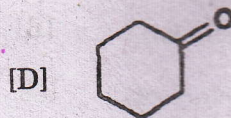
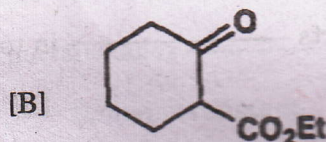
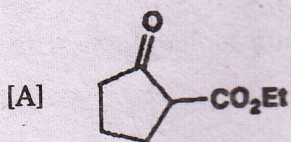
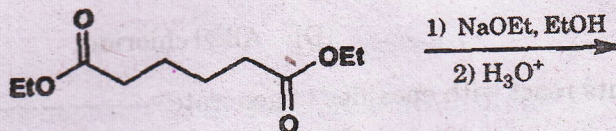
29. The Chernobyl disaster was a _____ that occurred in Ukraine :
- [A] Volcanic eruption. [B] Earthquake.
[C] Tsunami disaster. [D] Nuclear accident.
30. In Zeisel's method, the ester is first converted in to _____.
- [A] Alcohol. [B] Carboxylic acid.
[C] Alkyl iodide. [D] Alkyl chloride.
31. Organolithium reagents react with epoxides to generate _____.
- [A] Esters. [B] Ethers.
[C] Alcohols. [D] Ketons.
32. Wittig reaction converts _____ in to an alkene.
- [A] A ketone. [B] An alkane.
[C] An amine. [D] An alkyne.
33. The colour of potassium dichromate does not change on addition of _____.
- [A] 2-methylpropan-1-ol. [B] 2-methylpropan-2-ol.
[C] Butan-2-ol. [D] Butan-1-ol.
34. The catalyst used in Meerwein-Ponndorf-Verley reduction is _____.
- [A] Aluminium triisopropoxide. [B] Anhydrous aluminium chloride.
[C] Triphenyl phosphine. [D] Sodium ethoxide.
35. Fehling's solution B consists of _____ and an alkali.
- [A] Chevrel's salt. [B] Mohr's Salt.
[C] Bobbitt's salt. [D] Rochelle salt.
36. The named organic reaction where acetone is converted in to propane using zinc amalgam is called _____.
- [A] MPV reduction. [B] Wolff Kishner Reduction.
[C] Birch reduction [D] Clemmensen reduction.

Turn over

37. The product obtained in the Benzoin Condensation is _____.

- [A] α -hydroxy ester. [B] α -diketone.
 [C] α -hydroxy ketone. [D] α -hydroxy acid.

38. Which is the main product of the following reaction ?



39. Furan is commercially prepared by heating _____ with copper at very high temperature.

- [A] 1-butene. [B] 1, 3-butadiene.
 [C] n-butane. [D] 2-butene.

40. When the rate of the reaction is equal to the rate constant, the order of the reaction is _____.

- [A] Zero order. [B] First order.
 [C] Second order. [D] Third order.

41. A reaction passes through multiple pathways resulting in branched products is called :

- [A] Consecutive reaction. [B] Chain reaction.
 [C] Opposing reaction. [D] Parallel reaction.

42. Collision theory, theory used to predict the _____ of chemical reactions, particularly for gases.
- [A] Product. [B] Yield.
[C] Rates. [D] Number of isomers.
43. The correct expression among the following is :
- [A] $\Delta G^\circ = RT \ln K$. [B] $\Delta G^\circ = -RT \ln K$.
[C] $\Delta G^\circ = RT \ln K$. [D] $\Delta G^\circ = -RT \ln K$.
44. Which among the following is not a characteristic of chemisorption ?
- [A] It is a multi-layer phenomenon. [B] It is reversible.
[C] Its heat of absorption is high. [D] It is specific.
45. Which theory best suits for heterogeneous catalysis ?
- [A] Adsorption. [B] Paratoid.
[C] Intermediate. [D] Nucleate.
46. Where does inhibitor binds on enzyme in mixed inhibition ?
- [A] At active site. [B] Allosteric site.
[C] Does not bind on enzyme. [D] Binds on substrate.
47. Pattinson's process is a method for removing _____ from lead :
- [A] Iron. [B] Gold.
[C] Copper. [D] Silver.
48. The spontaneous loss of water by a hydrated salt is called _____.
- [A] Efflorescence. [B] Crystallization.
[C] Deliquesce. [D] Sublimation.
49. _____ gives a generalisation which governs the distribution of a solute between two non-miscible solvents.
- [A] Planck's distribution law. [B] Maxwell distribution law.
[C] Nernst's distribution law. [D] Boltzmann distribution law.

Turn over

50. The _____ effect states that the increase in the conductivity of an electrolyte solution when the applied voltage has a very high frequency.
- [A] Debye- Huckel. [B] Wein.
[C] Debye-Falkenhagen. [D] Onsager.
51. Ruhemann's purple is obtained in _____ test.
- [A] Biuret. [B] Edmann.
[C] Xanthoprotein. [D] Ninhydrin.
52. If carbohydrate is present, a _____ colour ring is formed in Molisch's test.
- [A] Purple. [B] Blue.
[C] Yellow. [D] Green.
53. Warfarin is an example of a _____.
- [A] Fungicide. [B] Herbicide.
[C] Insecticides. [D] Rodenticide.
54. Polyvinyl chloride is mainly prepared by _____ polymerization :
- [A] Suspension. [B] Precipitation.
[C] Solution. [D] Emulsion.
55. The reaction of hexamethylene diamine with adipic acid produces _____.
- [A] Terylene. [B] Nylon 66.
[C] Rayon. [D] Nylon 6.
56. Wolff-Kishner reduction of acetophenone produces _____.
- [A] Toluene. [B] Benzene.
[C] Styrene. [D] Ethyl benzene.
57. Corey-House Synthesis uses _____ and _____ catalysts.
- [A] Li-Cul. [B] Lil-Cu.
[C] Li-Kl. [D] Li-Col.

58. By the use of Kolbe electrolysis process, an aqueous solution of _____ acetate is used to produce ethane.
- [A] Calcium. [B] Potassium.
[C] Sodium. [D] Magnesium.
59. Anti-Markovnikov addition is best observed in presence of _____.
- [A] Organometallic compounds. [B] Strong bases.
[C] Peroxides. [D] Strong acids.
60. Baeyer's reagent is an _____ solution of cold KMnO_4 .
- [A] Acidic. [B] Ammoniacal.
[C] Alcoholic. [D] Alkaline.
61. In E_1 reaction a _____ is formed :
- [A] Carbanion. [B] Carbocation.
[C] Carbene. [D] Carbon free radical.
62. Aromaticity of the following compounds are in the order of _____.
- [A] Pyridine > Pyrrole > Furan > Thiophene.
[B] Pyridine > Thiophene > Pyrrole > Furan.
[C] Pyridine > Pyrrole > Thiophene > Furan.
[D] Pyridine > Furan > Pyrrole > Thiophene.
63. The catalyst used in Birch reduction is _____.
- [A] Na in ethanol. [B] Li in liquid ammonia.
[C] Na in liquid ammonia. [D] Li in ethanol.
64. The sum of mole fraction of compounds of a solution is always _____.
- [A] Less than one but not zero. [B] Zero.
[C] More than one. [D] One.
65. Which of the following is a self-indicating indicator ?
- [A] Potassium hexacyanoferrate. [B] Potassium permanganate.
[C] Diphenyl amine. [D] Methylene blue.

Turn over

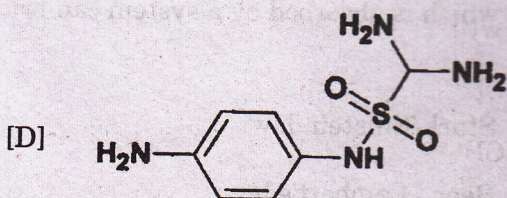
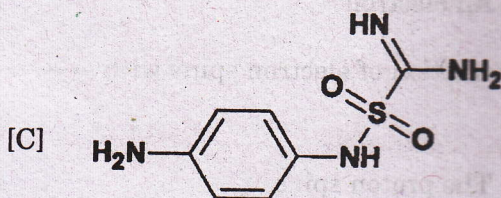
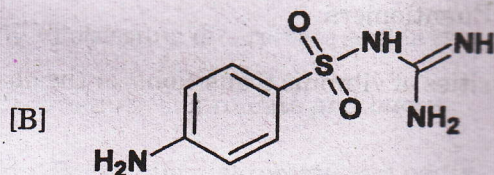
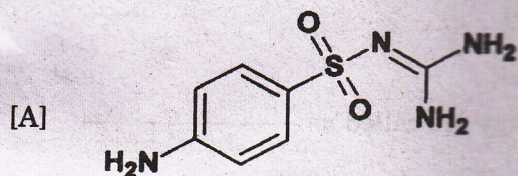
66. Methyl orange is _____.
- [A] Pink in acidic medium, yellow in basic medium.
 - [B] Yellow in acidic medium, pink in basic medium.
 - [C] Pink in acidic medium, colourless in basic medium.
 - [D] Colourless in acidic medium, pink in basic medium.
67. Sludge bulking can be controlled by _____.
- [A] Aeration.
 - [B] Coagulation.
 - [C] Denitrification.
 - [D] Chlorination.
68. How many hydrogen spectra are there ?
- [A] Six.
 - [B] Four.
 - [C] Seven.
 - [D] Three.
69. The flame colour of Cesium is _____.
- [A] Orange-red.
 - [B] Red-violet.
 - [C] Blue-violet.
 - [D] Blue-green.
70. According to _____ concept, an acid as anything that accepts negative species.
- [A] Usanovich.
 - [B] Lux-Flood.
 - [C] Lewis.
 - [D] Bronsted-Lowry.
71. The _____ is the divergence of the gradient of a function :
- [A] Hermitian operator.
 - [B] Laplace operator.
 - [C] Eigen operator.
 - [D] Hamiltonian.
72. The _____ states that the trial energy can be only greater or equal to the true energy.
- [A] Feynmann theorem.
 - [B] Virial, theorem.
 - [C] Comparison theorem.
 - [D] Variational theorem.

73. The _____ of a pure substance at a given temperature is the sum of all the entropy it would acquire on warming from absolute zero to the particular temperature :
- [A] Residual entropy. [B] Shannon entropy.
[C] Absolute entropy. [D] Thermal entropy.
74. Which one is the correct expression ?
- [A] $K_p = K_c (RT)^{\Delta n}$. [B] $K_c = K_x (RT)^{\Delta n}$.
[C] $K_p = K_x (RT)^{\Delta n}$. [D] $K_c = K_p (RT)^{\Delta n}$.
75. Arrange the order of acidity :
- [A] Chloroacetic Acid > Acetic Acid > Formic Acid > Benzoic Acid.
[B] Chloroacetic Acid > Formic Acid > Acetic Acid > Benzoic Acid.
[C] Chloroacetic Acid > Benzoic Acid > Formic Acid > Acetic Acid.
[D] Chloroacetic Acid > Formic Acid > Benzoic Acid > Acetic Acid.
76. Dispersion forces depend on _____ of the compound.
- [A] Molecular weight. [B] Dipole moment.
[C] Density. [D] Co-ordination number.
77. Arrange the stability of the following carbanions :
- [A] Chloromethyl > Ethyl > Benzyl > Isopropyl.
[B] Chloromethyl > Benzyl > Ethyl > Isopropyl.
[C] Chloromethyl > Benzyl > Isopropyl > Ethyl.
[D] Chloromethyl > Isopropyl > Ethyl > Benzyl.
78. A _____ is a basic principle, generalization, regularity or rule that holds true universally under particular conditions.
- [A] Assumption. [B] Scientific law.
[C] Hypothesis. [D] Theory.

Turn over

79. _____ is defined as the "total moles of a solute contained in a kilogram of a solvent."
[A] Mole fraction. [B] Normality.
[C] Molality. [D] Molarity.
80. _____ are used to wash the affected area when bromine burning occurs :
[A] Water and soap. [B] Water and dilute acid.
[C] Water and dilute alkali. [D] Water and hydrogen peroxide.
81. The modern periodic table was proposed by _____.
[A] Linus Pauling. [B] Dmitri Mendeleev.
[C] Niels Bohr. [D] Henry Moseley.
82. According to _____ a covalent bond is formed by a compound with a small cation, and a large anion :
[A] Fajans' rule. [B] Slater rule.
[C] Bayer's rule. [D] Mosley's rule.
83. How Does an Organic Material Decompose in the Buried Solid Waste ?
[A] By the soil particles.
[B] By the flow of water.
[C] By the action of oxidation.
[D] By the action of micro-organisms.
84. The Houben-Hoesch reaction used to prepare _____.
[A] Aryl acids. [B] Aryl aldehydes.
[C] Aryl ketones. [D] Aryl amines.
85. Kolbe Schmitt reaction converts phenol to _____.
[A] 2-hydroxy benzoic acid. [B] 3-hydroxy benzoic acid.
[C] 2-hydroxy phenol. [D] 4-hydroxy benzoic acid.
86. In Reimer Tiemann - Reaction, phenol is treated with _____.
[A] CCl_4 . [B] CHCl_3 .
[C] CH_2Cl_2 . [D] CH_3Cl .

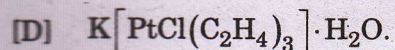
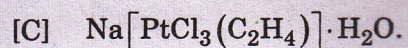
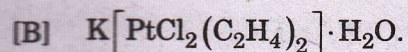
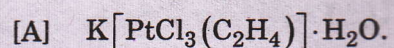
87. Kolbe electrolysis process for the generation of ethane involves a _____ mechanism.
- [A] Free radical. [B] Benzyne.
[C] Carbocation. [D] Carbanion.
88. Perking reaction of benzaldehyde with acetic anhydride in acetic acid produces _____.
- [A] Salicylic acid. [B] 4-ethyl benzoic acid.
[C] Benzoic acid. [D] Cinnamic acid.
89. _____ can be prepared from benzophenone and hydrogen azide using Schmidt reaction.
- [A] Benzanilide. [B] Acetanilide.
[C] Aniline. [D] Benzamide.
90. The structure of Sulfaguanidine :



Turn over

91. Diastereomers are compounds with same molecular formula and sequence of bonded elements but are _____.
- [A] Non-superimposable mirror images.
 - [B] Non-superimposable mirror images.
 - [C] Superimposable non-mirror images.
 - [D] Non-superimposable non-mirror images.
92. In the Fischer projection, threo isomers have two :
- [A] Similar groups are on the opposite side.
 - [B] Similar groups are on the same side.
 - [C] Larger groups are on the opposite side.
 - [D] Larger groups are on the same side.
93. The isomers which are connected in different way are called as _____.
- [A] Constitutional isomers.
 - [B] Geometrical isomers.
 - [C] Optical isomers.
 - [D] Enantiomers.
94. The Franck-Condon Principle describes the intensities of vibronic transitions, or the absorption or emission of _____.
- [A] A proton.
 - [B] A photon.
 - [C] A free radical.
 - [D] An electron.
95. The hyperfine splitting of ESR caused by the interaction of electron spins with _____ in the sample.
- [A] The neutrons.
 - [B] The proton spins.
 - [C] Other electron spins.
 - [D] The magnetic nuclei.
96. The _____ states that only that light which is absorbed by a system can bring about a photochemical change
- [A] Jablonski law.
 - [B] Stark-Einstein law.
 - [C] Grotthuss-Draper law.
 - [D] Beer - Lambert's law.

97. Zeise's salt is :



98. The _____ of solids describes the quantum state that an electron takes inside a metal solid.

[A] Valance bond theory.

[B] Band theory.

[C] Molecular orbital theory.

[D] Free electron theory.

99. Which is the metal found in Chlorophyll ?

[A] Sodium.

[B] Potassium.

[C] Iron.

[D] Magnesium.

100. Guignets green is made from :

[A] Sodium dichromate and boric acid.

[B] Potassium dichromate and boric acid.

[C] Sodium dichromate and borax .

[D] Potassium dichromate and borax.