

## 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.*

- Born Lande equation is used to calculate \_\_\_\_\_.  
[A] Lattice energy. [B] Electron affinity.  
[C] Electronegativity. [D] Bond length.
- $\text{AlCl}_3$  is in solid-state has a \_\_\_\_\_ structure.  
[A] Body centered. [B] Face centered.  
[C] Cubic close-packed. [D] Hexagonal.
- Among the four oxychloro acids the highest acid strength is for :  
[A]  $\text{HClO}_4$ . [B]  $\text{HClO}_2$ .  
[C]  $\text{HClO}_3$ . [D]  $\text{HOCl}$ .
- 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.
- Which element has the most stable isotope ?  
[A] Cobalt. [B] Barium.  
[C] Aluminium. [D] Lead.
- 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.

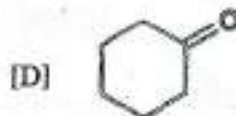
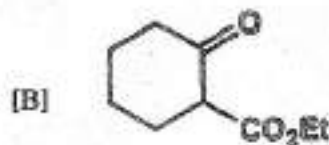
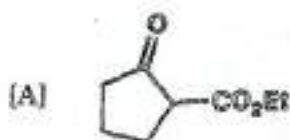
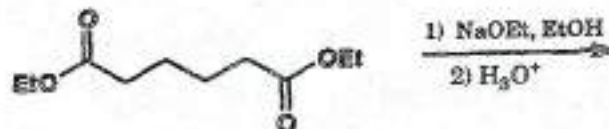
29. The Chernobyl disaster was a \_\_\_\_\_ that occurred in Ukraine :
- [A] Volcanic eruption. [B] Earthquake.  
[C] Tsunami disaster. [D] Nuclear accident.
30. In Zeisel's method, the ester is first converted in to \_\_\_\_\_.
- [A] Alcohol. [B] Carboxylic acid.  
[C] Alkyl iodide. [D] Alkyl chloride.
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] Chevreul's salt. [B] Mohr's Salt.  
[C] Bobbitt's salt. [D] Rochelle salt.
36. The named organic reaction where in acetone is converted in to propane using zinc amalgam is called \_\_\_\_\_.
- [A] MPV reduction. [B] Wolff Kishner Reduction.  
[C] Birch reduction [D] Clemmensen reduction.



37. The product obtained in the Benzoin Condensation is \_\_\_\_\_.

- [A]  $\alpha$ -hydroxy ester.                      [B]  $\alpha$ -diketone.  
 [C]  $\alpha$ -hydroxy ketone.                    [D]  $\alpha$ -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] Absorption. [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.

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.



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.

9. Anti-Markovnikov addition is best observed in presence of \_\_\_\_\_.

- [A] Organometallic compounds. [B] Strong bases.  
[C] Peroxides. [D] Strong acids.

10. Baeyer's reagent is an \_\_\_\_\_ solution of cold  $\text{KMnO}_4$ .

- [A] Acidic. [B] Ammoniacal.  
[C] Alcoholic. [D] Alkaline.

11. In E1 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 is 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.

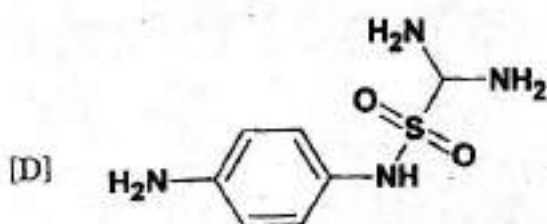
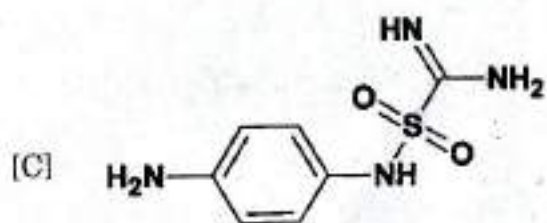
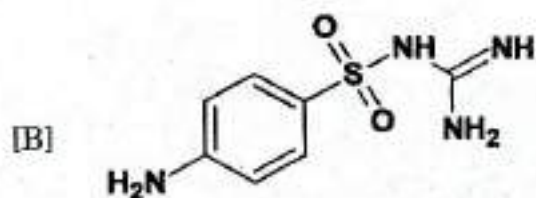
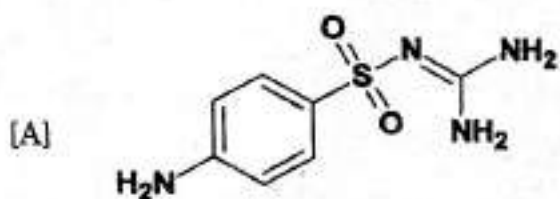
73. The \_\_\_\_\_ of a pure substance at a given temperature is the sum of all the entropy it would acquire on warming from absolute zero to the particular temperature :
- [A] Residual entropy. [B] Shannon entropy.  
[C] Absolute entropy. [D] Thermal entropy.
74. Which one is the correct expression ?
- [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]  $\text{CCl}_4$ . [B]  $\text{CHCl}_3$ .  
[C]  $\text{CH}_2\text{Cl}_2$ . [D]  $\text{CH}_3\text{Cl}$ .

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 :



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 :
- [A]  $\text{K}[\text{PtCl}_3(\text{C}_2\text{H}_4)] \cdot \text{H}_2\text{O}$ .      [B]  $\text{K}[\text{PtCl}_2(\text{C}_2\text{H}_4)_2] \cdot \text{H}_2\text{O}$ .
- [C]  $\text{Na}[\text{PtCl}_3(\text{C}_2\text{H}_4)] \cdot \text{H}_2\text{O}$ .      [D]  $\text{K}[\text{PtCl}(\text{C}_2\text{H}_4)_3] \cdot \text{H}_2\text{O}$ .
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.