

P.G. ENTRANCE EXAMINATION, APRIL 2024

CHEMISTRY/CHEMISTRY (NANOSCIENCE)

Time : Two Hours

Maximum : 400 Marks

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

1. The inert pair effect is the reluctance of _____ electrons for participating in bonding.
(A) s. (B) p.
(C) d. (D) f.
2. Born Haber cycle cannot be used to measure _____.
(A) Electronegativity. (B) Lattice energy.
(C) Electron affinity. (D) Ionization energy.
3. Among the four oxychloro acids the weakest acid is _____.
(A) HClO_4 . (B) HClO_3 .
(C) HClO_2 . (D) HOCl .
4. Which of the following atomic particles have the least mass ?
(A) Proton. (B) Electron.
(C) Deuteron. (D) Neutron.
5. Which of the following methods is used to determine the age of organic matter in the archaeology field ?
(A) Neutron activation analysis.
(B) Radiotherapy.
(C) Radiocarbon dating.
(D) Tracer technique.

Turn over

6. Bohr radius is _____ the electron rest mass.
- (A) Inversely proportional to the square of.
 - (B) Directly proportional to the square of.
 - (C) Inversely proportional to.
 - (D) Directly proportional to.
7. According to the _____, two atomic orbitals overlap resulting in the formation of molecular orbitals :
- (A) Metallic theory.
 - (B) Band theory.
 - (C) Valence bond theory.
 - (D) Molecular orbital theory.
8. The shape of sp^3 hybridized molecule is _____.
- (A) Tetrahedral.
 - (B) Hexagonal.
 - (C) Linear.
 - (D) Planar.
9. The ratio of a gas's molar volume to that of an ideal gas at constant temperature and pressure is known as the _____.
- (A) Isothermal constant.
 - (B) Compressibility factor.
 - (C) Isobar constant.
 - (D) Critical constant.
10. Line joining places of equal temperature are called _____.
- (A) Isobars.
 - (B) Isohyets.
 - (C) Isotherms.
 - (D) Isochores.
11. The specific volume of water when heated from 0°C _____.
- (A) Increases steadily.
 - (B) First increases then decreases.
 - (C) Decreases steadily.
 - (D) First decreases then increases.
12. Change in enthalpy of a system is the heat supplied for _____.
- (A) Constant pressure.
 - (B) Constant entropy.
 - (C) Constant temperature.
 - (D) Constant volume.

13. At very high pressure, as compared to a real gas, An ideal gas occupies _____.
(A) Less volume. (B) More volume.
(C) Same volume. (D) Infinite volume.
14. A perfect gas at 27°C is heated at constant pressure till its volume is double. The final temperature is _____ $^{\circ}\text{C}$.
(A) 54. (B) 327.
(C) 108. (D) 654.
15. The _____ law of thermodynamics states that if two bodies are each in thermal equilibrium with some third body, then they are also in equilibrium with each other.
(A) Zeroth. (B) First.
(C) Second. (D) Third.
- 16 Potash alum is :
(A) $\text{NH}_4\text{Al}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$. (B) $\text{NH}_4\text{Fe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.
(C) $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$. (D) $\text{NaFe}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$.
17. The formula of the complex formed in the brown ring test for nitrate is _____.
(A) FeSO_4NO . (B) $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{3+}$.
(C) $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{+}$. (D) $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$.
18. An aqueous solution of a substance gives a white precipitate with dil. HCl, which dissolves on heating. When H_2S is passed through the hot acidic solution, a black precipitate is obtained. The substance is an ion of :
(A) Hg. (B) Cu.
(C) Ag. (D) Pb.

19. In _____ soluble compounds in a solution are eliminated during the course of precipitation.
- (A) Post - precipitation. (B) Direct precipitation.
(C) Co-precipitation. (D) Homogeneous precipitation.
20. For which of the followings, froth flotation method is used for concentration ?
- (A) Zinc blend. (B) Haematite.
(C) Magnetite. (D) Camallite.
21. Brass is _____.
- (A) 50 % copper and 50 % zinc. (B) 66 % copper and 34 % zinc.
(C) 88 % copper and 12 % tin. (D) 66 % zinc and 34 % copper.
22. In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is _____.
- (A) 1. (B) 2.
(C) 3. (D) 4.
23. The element which cannot form oxyacid is _____.
- (A) Chlorine. (B) Bromine.
(C) Fluorine. (D) Iodine.
24. Which of the following noble gases do not occur in the elemental state in the atmosphere ?
- (A) Helium. (B) Neon.
(C) Argon. (D) Radon.
25. The catalyst used in the preparation of poly siloxanes is _____.
- (A) Grignard reagent. (B) Lewis acid.
(C) Cumene hydroperoxide. (D) Benzoyl peroxide.
26. The Great Smog of London was occurred during _____.
- (A) 5 - 9 November 1953. (B) 5 - 9 December 1952.
(C) 5- 9 December 1953. (D) 5 - 9 November 1952.

27. The major ingredient of photochemical smog is _____.
(A) Nitrogen oxides. (B) Sulphur oxides.
(C) Fluorocarbons. (D) Carbon oxides
28. High COD to BOD ratio of an organic pollutant represents _____.
(A) Presence of free oxygen for aerobic decomposition.
(B) Presence of toxic materials in the pollutant.
(C) High degradability of the pollutant.
(D) Low degradability of the pollutant.
29. The main causes of temporary hardness of water are due to the presence of _____.
(A) Magnesium chloride. (B) Calcium sulphate.
(C) Magnesium carbonate. (D) Magnesium sulphate.
30. Minamata disaster was caused by _____.
(A) Methyl mercury. (B) Mercury.
(C) Phenyl mercury. (D) Mercuric chloride.
31. In Claisen rearrangement ether is converted in to _____.
(A) An amine. (B) An alcohol.
(C) A ketone. (D) An ester.
32. Reaction of an epoxide with Grignard reagent generates _____.
(A) Aldehydes. (B) Primary alcohols.
(C) Secondary alcohols. (D) Ketones.
33. Wittig reaction converts a ketone in to an _____.
(A) Alkane. (B) Alkene.
(C) Alkyne. (D) Alcohol.
34. Oxidation of isopropyl alcohol with CrO_3 produces _____.
(A) Acetic acid. (B) Propylene glycol.
(C) Acetaldehyde. (D) Acetone.

Turn over

35. The catalyst used in Oppenauer Oxidation is _____.
- (A) Aluminium triisopropoxide.
(B) Triphenyl phosphine.
(C) Anhydrous aluminium chloride.
(D) Sodium ethoxide.
36. _____ is an alkaline solution of ammoniacal silver nitrate.
- (A) Borsche's reagent. (B) Schiff reagent.
(C) Fehling's solution. (D) Tollens' reagent.
37. The named organic reaction where in acetone is converted in to propane using hydrazine is called _____.
- (A) Birch reduction. (B) MPV reduction.
(C) Wolff Kishner Reduction. (D) Clemmensen reduction.
38. The product obtained in the Aldol Condensation is _____.
- (A) β -hydroxy ketone. (B) β -diketone.
(C) β -hydroxy ester. (D) β -hydroxy acid.
39. Which of the following is the least abundant aldol adduct formed from an equimolar mixture of ethanal and propanone in aqueous NaOH solution ?
- (A)
$$\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3\text{CHCH}_2\text{CHO} \end{array}$$
 (B)
$$\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3\text{CHCH}_2\text{COCH}_3 \end{array}$$
- (C)
$$\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3\text{CCH}_2\text{CHO} \\ | \\ \text{CH}_3 \end{array}$$
 (D)
$$\begin{array}{c} \text{OH} \\ | \\ \text{CH}_3\text{CCH}_2\text{COCH}_3 \\ | \\ \text{CH}_3 \end{array}$$
40. Chichibabin synthesis is used for the preparation of _____.
- (A) Quinoline. (B) Pyridine.
(C) Furan. (D) Indole.

41. In the reaction $2A + B \rightarrow A_2B$, if the concentration of A is doubled and that of B is halved, then the rate of the reaction will _____.
- (A) Increase 2 times. (B) Increase 4 times.
(C) Decrease 2 times. (D) Remain the same.
42. A reaction passes through an intermediate before attaining the final product is called _____.
- (A) Parallel reaction. (B) Chain reaction.
(C) Consecutive reaction. (D) Opposing reaction.
43. The relationship between rate constant and _____ can be deduced from the Arrhenius equation.
- (A) Temperature. (B) Enthalpy.
(C) Pressure. (D) Free energy.
44. The Lindemann mechanism explains _____ that take place in gas phase.
- (A) Unilayer absorption. (B) Bilayer absorption.
(C) Bimolecular reactions. (D) Unimolecular reactions.
45. Which of the following isotherm is applicable to physical adsorption ?
- (A) Langmuir. (B) Freundlich.
(C) BET. (D) Kisluk.
46. Which theory best suits for homogeneous catalysis ?
- (A) Absorption. (B) Nucleate.
(C) Intermediate. (D) Paratoid.
47. The molecule which acts directly on an enzyme to lower its catalytic rate is _____.
- (A) Repressor. (B) Inhibitor.
(C) Modulator. (D) Regulator.

48. The interdependence of the pressure and temperature along the phase equilibrium curve of a pure substance is shown by _____.
- (A) Clausius-Clapeyron equation.
 - (B) Gibbs Helmholtz equation.
 - (C) Gibbs Duhem equation.
 - (D) Arrhenius equation.
49. The process by which a substance absorbs moisture from the atmosphere until it dissolves in the absorbed water and forms a solution :
- (A) Crystallization.
 - (B) Sublimation.
 - (C) Efflorescence.
 - (D) Deliquescence.
50. Nernst's distribution law gives a generalisation which governs the distribution of a solute between _____.
- (A) Two miscible solvents.
 - (B) Two non-miscible solvents.
 - (C) Two organic solvents.
 - (D) A non-miscible solvent and a miscible solvent.
51. A _____ is a reagent that is extremely pure, stable, has no water of hydration and has a high molecular weight.
- (A) Primary standard.
 - (B) Titrant.
 - (C) Secondary standard.
 - (D) Tertiary standard.
52. According to _____ an ionic bond is formed by a compound with a large cation, and a small anion.
- (A) Bayer's rule.
 - (B) Mosley's rule.
 - (C) Slater rule.
 - (D) Fajans' rule.
53. Copious amount of _____ is used to wash the affected area for phenol burning.
- (A) Water.
 - (B) Dilute Na_2CO_3 solution.
 - (C) Soap and water.
 - (D) Dilute NaHCO_3 solution.

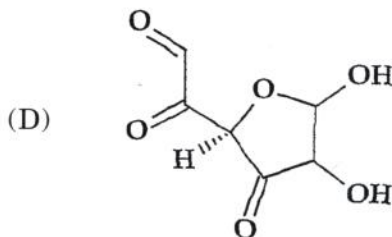
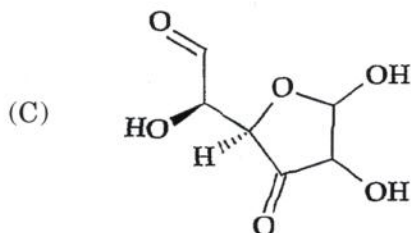
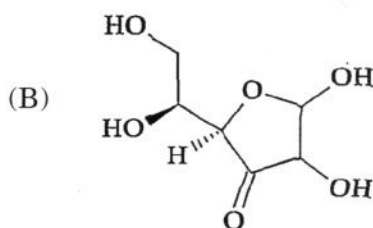
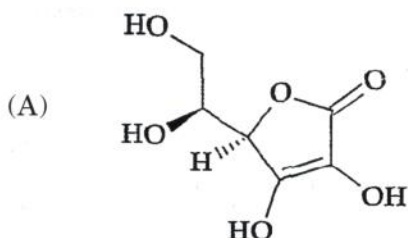
54. A _____ is a critical account of what has been published on a topic by accredited researchers.

- (A) Bibliography. (B) Manuscript.
(C) Review. (D) Patent.

55. A supposition or a system of ideas intended to explain something is called _____.

- (A) Assumption. (B) Hypothesis.
(C) Law. (D) Theory.

56. The structure of Vitamin C is :



57. If carbohydrate is present Benedict's test gives a colour change from _____.

- (A) Blue to red. (B) Green to blue.
(C) Blue to green. (D) Green to red.

58. The main component of talcum powder is _____.

- (A) Magnesium sulphate. (B) Magnesium silicate.
(C) Barium sulphate. (D) Barium silicate.

59. The reaction of a diisocyanate with a diol yields _____.
(A) Polyurea. (B) Polycarbomate.
(C) Polyester. (D) Polyurethane.
60. Peroxides are used in _____ polymerization reactions.
(A) Condensation. (B) Addition.
(C) Free radical. (D) Anionic.
61. The flame colour of Rubidium is _____.
(A) Red-Violet. (B) Orange-red.
(C) Blue-violet. (D) Blue-green.
62. According to the _____ Concept, substance must have an oxide ion in order to explain its acidity or basicity.
(A) Lewis. (B) Bronsted-Lowry.
(C) Lux-Flood. (D) Arrhenius.
63. How many postulates are there in Bohr atomic model ?
(A) Three. (B) Four.
(C) Two. (D) Five.
64. The _____ states that no two electrons in the same atom can have identical values for all four of their quantum numbers.
(A) Hund's rule. (B) De Broglie's principle.
(C) Aufbau principle. (D) Pauli's exclusion principle.
65. The _____ is the difference in entropy between a non-equilibrium state and crystal state of a substance close to absolute zero.
(A) Shannon entropy. (B) Thermal entropy.
(C) Absolute entropy. (D) Residual entropy.
66. Which one is the correct expression ?
(A) $\Delta G^\circ = -RT \ln K$. (B) $\Delta G^\circ = RT \log K$.
(C) $\Delta G^\circ = RT \ln K$. (D) $\Delta G^\circ = -RT \log K$.

67. According to ————— quantum theory, Different atoms and molecules can emit or absorb energy in discrete quantities only.
- (A) De Broglie's. (B) Planck's.
(C) Einstein's. (D) Bohr's.
68. Arrange the order of basicity :
- (A) Ammonia > p-anisidine > p-nitroaniline > aniline.
(B) Ammonia > p-nitroaniline > aniline > p-anisidine.
(C) Ammonia > aniline > p-anisidine > p-nitroaniline.
(D) Ammonia > p-anisidine > aniline > p-nitroaniline.
69. Arrange the stability of the following carbocations :
- (A) Benzyl > Ethyl > Methyl > Chloromethyl
(B) Chloromethyl > Benzyl > Ethyl > Methyl
(C) Benzyl > Methyl > Chloromethyl > Ethyl
(D) Benzyl > Ethyl > Chloromethyl > Methyl
70. The boiling point of 2-aminophenol is higher than that of 3-aminophenol is due to —————.
- (A) Inductive effect.
(B) Intermolecular hydrogen bonding.
(C) Intramolecular hydrogen bonding.
(D) Van der Walls force.
71. Which of the following alkane can exhibit optical activity ?
- (A) 3-Methylpentane. (B) 3-Methylhexane.
(C) Isopentane. (D) Neopentane.

72. Enantiomers are a pair of molecules that are _____.
(A) Mirror images of one another but cannot be superimposed one upon the other.
(B) Not mirror images of one another but cannot be superimposed one upon the other.
(C) Mirror images of one another and superimposed one upon the other.
(D) Not mirror images of one another and superimposed one upon the other.
73. The order of stability of cyclohexane conformations is :
(A) Chair > twist boat > half chair > boat.
(B) Chair > boat > half chair > twist boat.
(C) Chair > half chair > twist boat > boat.
(D) Chair > twist boat > boat > half chair.
74. Clemmenson's reduction of benzaldehyde produces :
(A) Toluene. (B) Benzene.
(C) Benzyl alcohol. (D) Benzoic acid.
75. Wurtz's reaction uses _____ metal in _____ solvent.
(A) Magnesium - ether. (B) Potassium - ethanol.
(C) Sodium - ether. (D) Lithium - ammonia.
76. The stable compound obtained in the dehydrohalogenation of 2-bromobutane is 2-butene. This is in accordance with _____.
(A) Hoffmann rule. (B) Saytzeff rule.
(C) Markovnikov's rule. (D) Anti-Markovnikov's rule.
77. Lindlar's catalyst is _____.
(A) Rh deposited on CaCO_3 . (B) Pt deposited on CaCO_3 .
(C) Pd deposited on CaCO_3 . (D) Rb deposited on CaCO_3 .
78. Retention of configuration occurs in _____ reaction.
(A) $\text{S}_{\text{N}}\text{i}$. (B) $\text{S}_{\text{N}}1$.
(C) $\text{S}_{\text{N}}\text{Ar}$. (D) $\text{S}_{\text{N}}2$.

79. Aromaticity is due to _____.
(A) Delocalization of electrons present in the π - π orbitals.
(B) Presence of conjugated double bonds.
(C) Presence of planar structure.
(D) Presence of double bonds.
80. Friedel - Crafts alkylation is catalysed by _____.
(A) Aluminum carbonate.
(B) Aluminum chloride
(C) Anhydrous aluminum carbonate.
(D) Anhydrous aluminum chloride.
81. Birch reduction of benzene gives _____.
(A) 1, 3-cyclohexadiene. (B) 1,4-cyclohexadiene.
(C) Cyclohexene. (D) Cyclohexane.
82. The migrating aptitude of groups in pinacole - pinacolone rearrangement is _____.
(A) Aryl > cyclohexyl > benzyl > methyl.
(B) Methyl > cyclohexyl > benzyl > aryl
(C) Cyclohexyl > benzyl > aryl > methyl.
(D) Benzyl > cyclohexyl > aryl > methyl
83. The process for extracting solid natural resources from waste materials that previously have been disposed of by burying them in the ground is known as _____.
(A) Excavation. (B) Landfill mining.
(C) Unearthing. (D) Landfill leachates.
84. When basic solution is titrated against HCl in the burette with Methyl orange indicator, the endpoint is the color change from _____.
(A) Yellow to Orange. (B) Orange to Yellow.
(C) Yellow to Violet. (D) Violet to orange.

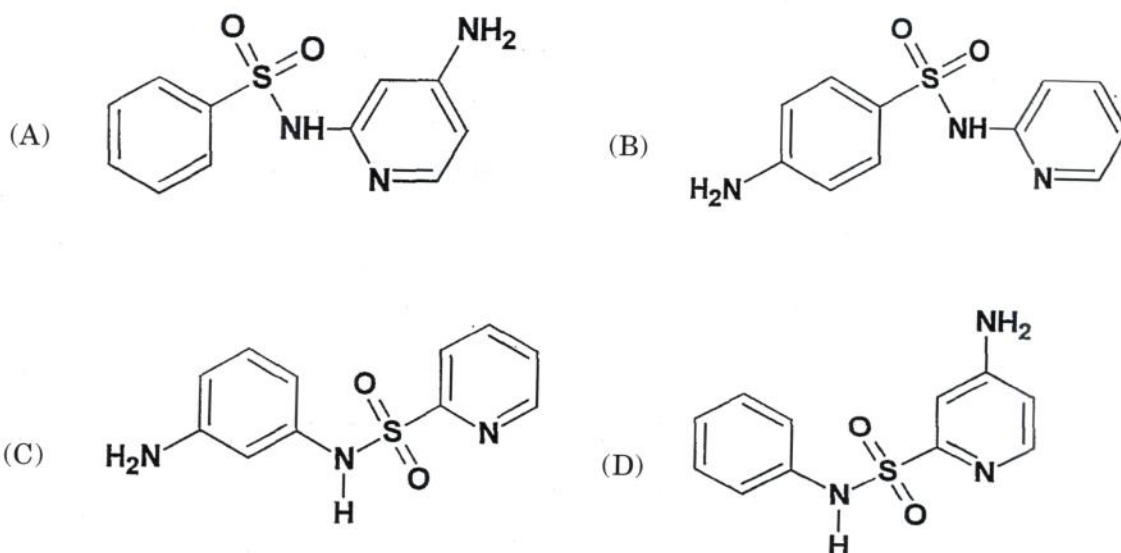
Turn over

85. In EDTA method, the purpose of adding buffer is———.
- (A) To maintain the pH of 8-10 range.
 - (B) To maintain the concentration of the reagent.
 - (C) To maintain the pH of 4-6 range.
 - (D) To maintain the pH of 6-8 range.
86. The amount of NaOH used in the titration of 100 ml 0.1 N HCl is ———.
- (A) 4.0 g.
 - (B) 0.4 g.
 - (C) 0.04 g.
 - (D) 2.0 g.
87. The Victor Meyer test is used to distinguish between———.
- (A) Primary and secondary proteins.
 - (B) Mono and di carboxylic acids.
 - (C) Primary, secondary, and tertiary amines.
 - (D) Primary, secondary and tertiary alcohols.
88. On addition of NaCl the ionization of NaOH ———.
- (A) Decreases.
 - (B) Ceases.
 - (C) Remain the same.
 - (D) Increases.
89. Reimer Tiemann Reaction is used to convert phenol to———.
- (A) 4-hydroxy toluene.
 - (B) 2-hydroxy benzaldehyde.
 - (C) 3-hydroxy benzaldehyde.
 - (D) 2-hydroxy benzoic acid.
90. The Mutual exclusion principle states that no normal modes can be both Infrared and——— active in a molecule that possesses a centre of symmetry.
- (A) Raman.
 - (B) NMR.
 - (C) ESR.
 - (D) UV.
91. Knoevenagel condensation of acetaldehyde with malonic acid in pyridine produces———.
- (A) Crotonic acid.
 - (B) Lactic acid.
 - (C) Tartaric acid.
 - (D) Succinic acid.

92. According to _____ metals exhibit two types of valency (i) primary valency ; and (ii) secondary valency

- (A) Sidgwick's concept. (B) EAN rule.
(C) Jahn-Teller Theorem. (D) Werner's theory.

93. The structure of Sulfapyridine is :



94. In Hell Volhard Zelinsky reaction, the bromination of carboxylic acid takes place at _____ position.

- (A) γ (gama). (B) δ (delta).
(C) α (alpha). (D) β (beta).

95. The _____ describes the magnetic interactions between neighboring, non-equivalent NMR-active nuclei.

- (A) Nuclear Overseer Effect. (B) Spin-spin coupling.
(C) j.j - coupling. (D) Chemical shift.

96. The _____ states that for each photon of light absorbed by a chemical system, only one molecule is activated for subsequent reaction.

- (A) Grothus-Draper law. (B) Beer - Lambert's law.
(C) Jablonski law. (D) Stark-Einstein law.

Turn over

97. The _____ states that the electrons are moving freely and randomly moving in the entire volume of the metal like gas atoms in the gas container.
- (A) Free electron theory. (B) Valance bond theory.
(C) Molecular orbital theory. (D) Band theory.
98. Urea on Hofmann's bromamide reaction produces _____.
- (A) Ammonia. (B) Methyl cyanide.
(C) Hydrazine. (D) Methylamine.
99. Which is the metal found in Myoglobin ?
- (A) Potassium. (B) Sodium.
(C) Magnesium. (D) Iron.
100. In solid waste management, waste utilization is done by _____.
- (A) Reuse, reproduce and recycling.
(B) Recover, reclamation and reproduce.
(C) Recover, recycling and reproduce.
(D) Reuse, reclamation and recycling.