



**GSFC UNIVERSITY**  
**SCHOOL OF SCIENCE**  
**Admission Common Test for M.Sc. Chemistry, 2021-22**

**Time: 60 Minutes**

**Total Marks: 60**

**Instructions:**

- i. All questions are compulsory.
  - ii. All questions are Multiple Choice Questions.
  - iii. Each question Carries 1 Mark.
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1. Liquid chromatography can be performed in which of the following ways?
  - a. Only in columns
  - b. Only on plane surfaces
  - c. Either in columns or on plane surfaces
  - d. Neither in columns nor on plane surfaces
2. The most typical reaction of simple alkene is
  - a. Electrophilic substitution
  - b. Nucleophilic substitution
  - c. Electrophilic addition
  - d. Nucleophilic addition
3. What is the hybridization of sulphur in  $H_2S$ ?
  - a.  $sp$
  - b.  $sp^2$
  - c.  $sp^3$
  - d.  $sp^3d$
4. Dynamites containing \_\_\_\_\_, which increase the viscosity of the mix, are commonly known as "gelatins".
  - a. Cordite
  - b. Nitrocellulose



- c. Nitroglycerin
  - d. Smokless powder
5. Which of the following reagent can be used to distinguish between chlorobenzene and allyl chloride?
- a.  $H_2/Ni$
  - b.  $Br_2$  in  $CCl_4$
  - c.  $Zn/HCl$
  - d.  $NH_2NH_2$
6. Compared to the rate of inorganic reactions, the rate of organic reactions generally is
- a. slower because organic particles are ions
  - b. slower because organic particles contain covalent bonds
  - c. faster because organic particles are ions
  - d. faster because organic particles contain covalent bonds
7. When the electrons are aligned either parallel or antiparallel to the direction of external magnetic field, the electrons will proceed about the axis at a frequency that is proportional to which of the following?
- a. Applied magnetic field
  - b. Electron magnetic moment
  - c. Applied magnetic field and electron magnetic moment
  - d. Neither applied magnetic field not electron magnetic moment
8. "Cobalt - 60 is commonly used in radiation therapy because it emits
- a. alpha - rays
  - b. beta rays
  - c. gamma rays
  - d. X - rays
9. A zwitterion has which of the following properties
- a. no net charges
  - b. a high melting points
  - c. soluble in water
  - d. all of these



10. Optical isomerism is shown by
- n-butyl chloride
  - sec-butyl chloride
  - tert-butyl chloride
  - isobutyl chloride
11. Taj Mahal is said to be suffering from 'Marble Cancer'. What is Marble Cancer?
- Smokes filling the Taj Mahal from adjoining industries
  - Large number of fungus is Taj Mahal marbles
  - Acid rain which corrodes marble
  - Yellowing of marble on account of shoot particles
12. Which of the following techniques would be most useful to identify and quantify the presence of a known impurity in a drug substance?
- NMR
  - IR
  - MS
  - HPLC
13. Which of the following compounds have lowest dipole moment?
- carbon tetrachloride
  - chloromethane
  - dichloromethane
  - chloroform
14. The gas is commonly used in anaesthesia
- methane
  - nitrous oxide
  - nitrogen
  - hydrogen peroxide
15. How many numbers of resonating structure stabilises a pyridine molecule?
- 4
  - 5



- c. 6  
d. 7
16. Lanthanoid (Ln) is known for its +3-oxidation state. Which of the following statement is not applicable?
- Ionic volume (radii) decreases as atomic number increases.
  - The compounds of Ln(III) are most of coloured.
  - Hydroxides of Ln(III) are most of basic
  - As volume of Ln(III) is more their compounds possess ionic nature.
17. Which of the following pair possess same volume?
- $Zr^{4+}$ ,  $Hf^{4+}$
  - $Zn^{2+}$ ,  $Hf^{4+}$
  - $Fe^{2+}$ ,  $Ni^{2+}$
  - $Zr^{4+}$ ,  $Ti^{4+}$
18. The outer electronic configuration of Gd (Atomic no. 64) is .....
- $4f^3 5d^5 6s^2$
  - $4f^8 5d^0 6s^2$
  - $4f^4 5d^4 6s^2$
  - $4f^7 5d^1 6s^2$
19. Four successive members of the first-row transition elements are listed ahead with atomic numbers. Which one of them is expected to have the highest  $E_o(M^{3+} | M^{2+})$  value?
- Co (Z = 27)
  - Cr (Z = 24)
  - Mn (Z = 25)
  - Fe (Z = 26)
20. Which of the following arrangements does not represent the correct order of the property stated against it?
- Sc < Ti < Cr < Mn: Number of oxidation states.
  - $V^{2+}$  <  $Cr^{2+}$  <  $Mn^{2+}$  <  $Fe^{2+}$ : Paramagnetic behavior
  - $Ni^{2+}$  <  $Co^{2+}$  <  $Fe^{2+}$  <  $Mn^{2+}$ : Ionic size



- d.  $\text{Co}^{3+} < \text{Fe}^{3+} < \text{Cr}^{3+} < \text{Sc}^{3+}$ : Stability in aqueous solution
21. Sc ( $Z = 21$ ) is a transition element but Zn ( $Z = 30$ ) is not because .....
- Both  $\text{Sc}^{3+}$  and  $\text{Zn}^{2+}$  ions are colourless and form with compounds.
  - In case of Sc,  $3d$  orbitals are partially filled but in Zn these are completely filled.
  - Last electron is assumed to be added to  $4s$  level in case of zinc.
  - Both Sc and Zn do not exhibit variable oxidation states.
22. Which of the following statements about the interstitial compounds is incorrect?
- They are much harder than the pure metal.
  - They have higher melting points than the pure metal.
  - They retain metallic conductivity.
  - They are chemically reactive.
23. Which among the following will be named as dibromidobis (ethylenediamine) chromium (III) bromide?
- $[\text{Cr}(\text{en})_2\text{Br}_2]\text{Br}$
  - $[\text{Cr}(\text{en})\text{Br}_4]^-$
  - $[\text{Cr}(\text{en})\text{Br}_2]\text{Br}$
  - $[\text{Cr}(\text{en})_3]\text{Br}_3$
24.  $\text{NiCl}_2\{\text{P}(\text{C}_2\text{H}_5)_2(\text{C}_6\text{H}_5)\}_2$  exhibits temperature dependent magnetic behavior. The coordination geometries of  $\text{Ni}^{2+}$  in paramagnetic and diamagnetic behavior are respectively .....
- Tetrahedral and Tetrahedral.
  - Square planar and Square planar.
  - Tetrahedral and Square planar.
  - Square planar and Tetrahedral.
25. The anion of acetyl acetone(acac) forms  $\text{Co}(\text{acac})_2$  chelates with  $\text{Co}^{3+}$ . The rings of the chelate are .....
- 3-membered
  - 4-membered
  - 6-membered
  - 5-membered



26. A magnetic moment at 1.73 B.M will be shown by one among the following
- $\text{TiCl}_4$
  - $[\text{CoCl}_6]^{4-}$
  - $[\text{Cu}(\text{NH}_3)_4]^{2+}$
  - $[\text{Ni}(\text{CN})_4]^{2-}$
27. Which of the following complex species is not expected to exhibit optical isomerism?
- $[\text{Co}(\text{en})_3]^{3+}$
  - $[\text{Co}(\text{en})_2\text{Cl}_2]^+$
  - $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
  - $[\text{Co}(\text{en})(\text{NH}_3)_2\text{Cl}_2]^+$
28. The octahedral complex of a metal ion  $\text{M}^{3+}$  with four monodentate ligands L1, L2, L3 and L4 absorbs wavelengths in the region of red, green, yellow and blue respectively. The increasing order of ligand field strength is....
- $\text{L}_3 < \text{L}_2 < \text{L}_4 < \text{L}_1$
  - $\text{L}_1 < \text{L}_3 < \text{L}_2 < \text{L}_4$
  - $\text{L}_4 < \text{L}_3 < \text{L}_2 < \text{L}_1$
  - $\text{L}_1 < \text{L}_2 < \text{L}_3 < \text{L}_4$
29. Among the following complexes the one which show zero crystal field stabilization energy is...
- $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$
  - $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
  - $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
  - $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
30. When concentrated HCl is added to an aqueous solution of  $\text{CoCl}_2$  its colour changes from reddish pink to deep blue. Which complex ion gives blue colour in this reaction ?
- $[\text{CoCl}_6]^{4-}$
  - $[\text{CoCl}_6]^{3-}$
  - $[\text{CoCl}_4]^{2-}$
  - $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
31. Natural rubber has:



- a. All trans-configuration
  - b. Alternate cis - and trans - configuration
  - c. Random cis - and trans - configuration
  - d. All cis-configuration
32. Which of the following statements about low density polythene is FALSE:
- a. It is used in the manufacture of buckets, dust-bins etc.
  - b. Its synthesis requires high pressure.
  - c. It is a poor conductor of electricity.
  - d. Its synthesis requires dioxygen or a peroxide initiator as a catalyst
33. The formation of which of the following polymers involves hydrolysis reaction?
- a. Nylon-6
  - b. Bakelite
  - c. Nylon-6,6
  - d. Terylene
34. Among halogens, the one which can oxidise water to oxygen is .....
- a. chlorine
  - b. bromine
  - c. fluorine
  - d. iodine
35. The letter 'D' in D-glucose signifies.
- a. configuration at all Chiral Carbons.
  - b. dextrorotatory.
  - c. that it is a monosaccharide.
  - d. configuration at the penultimate Chiral Carbon.
36. Which of the following statements is not correct for a nucleophile?
- a. Nucleophiles attack low  $e^-$  density sites
  - b. Nucleophiles are not electron seeking
  - c. Nucleophile is a Lewis acid
  - d. Ammonia is a nucleophile



37. In an  $S_N1$  reaction on chiral centres, there is:
- 100% retention
  - 100% inversion
  - 100% racemization
  - inversion more than retention leading to partial racemization.
38. In which of the following reactions ZSM-5 is useful?
- Toluene from benzene
  - Petrol from alcohol
  - Benzene from toluene
  - Toluene from heptane
39. Which of the following organic compound is obtained on heating of primary aliphatic amine with chloroform and ethanolic potassium hydroxide?
- One alkyl cyanide
  - One alkyl isocyanide
  - One alkenol
  - One alkendiol
40. Consider basic strength of amines in aqueous solution, which of the following has least  $pK_b$  value?
- $(CH_3)_3N$
  - $C_6H_5NH_2$
  - $(CH_3)_2NH$
  - $CH_3NH_2$
41. Which of the following compounds can be obtained by electrolytic reduction of nitrobenzene in strong acidic medium?
- p*-aminophenol
  - azoxybenzene
  - azobenzene
  - aniline
42. Give possible structural isomers of compound having formula of  $C_3H_9N$ .
- 4



- b. 5
- c. 2
- d. 3
43. Which of the following method is not use to produce aniline?
- Hydrolysis of phenyl isocyanide in acidic medium.
  - Degradation of benzenamide by  $\text{Br}_2$  in presence of basic solution.
  - By Reduction of nitrobenzene by  $\text{H}_2/\text{Pd}$  in presence of ethanol.
  - Reaction of potassium salt of phthalimide with chlorobenzene followed by hydrolysis with  $\text{NaOH}$  solution.
44. The correct statement regarding RNA and DNA, respectively is:
- The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose.
  - The sugar component in RNA is arabinose and the sugar component in DNA is ribose.
  - The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose.
  - The sugar component in RNA is arabinose and the sugar component in DNA is 2'- deoxyribose.
45. Which of the following is non-reducing sugar?
- Lactose
  - Glucose
  - Sucrose
  - Maltose
46. The correct difference between first and second order reactions is that..
- the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations
  - the rate of a first-order reaction does not depend on reactant concentrations; the rate of a second-order reaction does depend on reactant concentrations
  - a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed



- d. the half-life of a first-order reaction does not depend on  $[A]^0$  the half-life of a second-order reaction does depend on  $[A]^0$ .
47. When initial concentration of the reactant is doubled, the half-life period of a zero order reaction.....
- remains unchanged.
  - is halved.
  - is tripled.
  - is doubled.
48. At  $518^\circ\text{C}$ , the rate of decomposition of a sample of gaseous acetaldehyde, initially at a pressure of 363 torr, was  $1.00 \text{ torr s}^{-1}$  when 5% had reacted and  $0.5 \text{ torr s}^{-1}$  when 33% had reacted. The order of the reaction is:
- 2
  - 3
  - 1
  - 0
49. Molecules on the surface at critical micelle concentration.....
- get decomposed.
  - become soluble.
  - get associated.
  - get dissociated.
50. What will happen when alum is added in water?
- It forms aqua compounds and it removed.
  - Sulphur separates sand particles in form of precipitates.
  - Alum converts insoluble impurities into soluble one
  - It coagulates unnecessary particles
51. Which statement is wrong with reference to physical adsorption?
- Gases having liquid state adsorbed easily.
  - Multimolecular layer is formed on the surface of adsorbent at high pressure.
  - The value of adsorption enthalpy is less and positive.
  - Van der waals' attraction is present.



52. Which one is the best coagulating substance for  $\text{Fe}(\text{OH})_3$  colloid ?
- $\text{K}_3\text{PO}_4$
  - $\text{KNO}_3$
  - $\text{NaCl}$
  - $\text{MgSO}_4$
53. Which statement is incorrect for catalyst?
- It does not affect the equilibrium constant.
  - It increases the proportion of products in less time.
  - It decreases the activation energy of a reaction.
  - It increases the free energy change for the reaction.
54. During electrophoresis of colloidal sol of  $\text{Fe}(\text{OH})_3$ , the colloidal particles .....
- move towards anode and cathode both.
  - move towards cathode.
  - move towards anode.
  - do not move.
55. Name the enzyme due to which protein is converted into amino acid.
- Zymase
  - Pepsin
  - Urease
  - Cellulase
56. Based on which two opposite phenomena Langmuir derived adsorption isotherm equation?
- Adsorption and desorption of gas.
  - Rate of condensation and rate of evaporation become equal.
  - Kinetic theory and collision theory of gases.
  - Opposing collision of gaseous molecules.
57. Which of the following is not suitable for chemisorption ?
- It is irreversible.
  - It is multimolecular.



- c. Depends upon nature of gas.
- d. There is no noticeable effect of change in temperature.
58. In which of the following reaction oxidation of iron is not possible?
- Reaction in which rusting of iron plates.
  - Removal of colour of  $\text{CuSO}_4$  solution by iron.
  - Liberation of  $\text{H}_2$  gas from water vapour by iron at high temperature.
  - Production of  $\text{Fe}(\text{CO})_5$  from Fe.
59. Which of the following compound require least amount of acidic  $\text{KMnO}_4$  for complete oxidation of its 1 mole?
- $\text{FeC}_2\text{O}_4$
  - $\text{Fe}(\text{NO}_2)_2$
  - $\text{FeSO}_4$
  - $\text{FeSO}_3$
60. How long 3 ampere current should be pass to obtain 0.1 mol  $\text{Cl}_2$  gas through electrolysis of molten  $\text{NaCl}$ ?
- 220 minutes
  - 330 minutes
  - 55 minutes
  - 110 minutes

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