

Seat No.	
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P.G. Entrance Examination, May - 2023

**M.Sc. Chemistry (Inorganic/Organic/Physical/Analytical/Industrial/
Applied)**

CHEMISTRY

Sub. Code : 58713

Day and Date : Monday, 08 - 05 - 2023

Total Marks : 100

Time : 10.30 a.m. to 12.00 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Each question carries 1 mark.
 - 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
 - 4) Follow the instructions given on OMR sheet.
 - 5) Rough work shall be done on the sheet provided at the end of question paper.

1) $-(\Delta G)_{P,T} = \underline{\hspace{2cm}}$

A) $-(\Delta A)_T$

B) W_{rev}

C) zero

D) W_{net}

- 2) A decrease in value of Gibb's free energy at constant pressure and temperature is a measure of maximum reversible _____ work done by the system.

A) mechanical

B) non-mechanical

C) total

D) free

- 3) The forces between two different types of molecules is termed as _____ forces.

A) cohesive

B) van der walls

C) adhesive

D) retention

P.T.O.

- 9) When is a separation process not required in a manufacturing process?
- A) when there is a decomposition reaction
 - B) when there is a complete conversion
 - C) when the by products are in form of gases
 - D) when the reaction is reversible
- 10) Chemicals which are produced and handled in large lots and are often in a crude state called _____
- A) industrial
 - B) toxic
 - C) heavy
 - D) king
- 11) Who introduced first the electrochemical theory of corrosion?
- A) Whitney
 - B) Evans
 - C) Philips
 - D) Haber
- 12) Which metal is used for the galvanization of iron?
- A) Cr
 - B) Ni
 - C) Zn
 - D) Al
- 13) Gas-solid chromatography is best suited for separating _____
- A) thermally stable organic components
 - B) low molecular weight gaseous species
 - C) thermally stable inorganic components
 - D) volatile organic components

- 14) The choice of mobile phase for elution in ion-exchange chromatography is _____
- | | |
|--------------------|-------------------|
| A) acidic solution | B) basic solution |
| C) buffer solution | D) polar solution |
-
- 15) Which analytical method is based on the weight of the precipitate?
- | | |
|----------------------------|-----------------------------|
| A) acid base Titration | B) complexometric Titration |
| C) precipitation Titration | D) gravimetry |
-
- 16) Which sentence is false about gravimetric analysis?
- it is used for inorganic ion.
 - it is used to assay volatile organic compounds
 - it is used to assay barium sulphate.
 - it is used to assay of aluminium.
-
- 17) The spectra caused in the infrared region by the transition in vibrational levels in different modes of vibrations are called
- | | |
|------------------------|-----------------------|
| A) rotational spectra | B) electronic spectra |
| C) vibrational spectra | D) none of these |
-
- 18) Which radiation has rotational phenomenon?
- | | |
|--------------|-------------|
| A) Microwave | B) Infrared |
| C) X-rays | D) Visible |
-
- 19) For copper sulphate solution transmitted colour is bluish, while λ_{max} will appear in range of _____
- | | |
|---------------|---------------|
| A) 400-435 nm | B) 480-490 nm |
| C) 610-750 nm | D) 490-500 nm |

- 20) Optical density is given by _____
- A) $OD = \log I/I_0$ B) $OD = \log I/I_2$
 C) $OD = \log I_0/I$ D) $OD = \text{none of these}$
- 21) The formula of bastnaesite mineral is _____
- A) $CePO_4$ B) $(Y)PO_4$
 C) $CeFCO_3$ D) None of these
- 22) The observed electronic configuration of holmium is _____
- A) $[Xe] 4f^9 5d^0 6s^2$ B) $[Xe] 4f^{12} 5d^0 6s^2$
 C) $[Xe] 4f^{11} 5d^0 6s^2$ D) $[Xe] 4f^{14} 5d^0 6s^2$
- 23) $2Fe_2O_3 \cdot 3H_2O$ is _____
- A) magnetite black B) spathic iron
 C) haematite red D) limonite brown
- 24) The process of heating the hardened steel to a temperature much below redness and cooling it slowly is known as _____
- A) tempering B) nitriding
 C) hardening D) annealing
- 25) Lowest temperature at which a liquid ignites under ignition source is _____
- A) cetane index B) octane number
 C) calorific value D) flash point

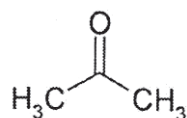
- 26) The standards used to assign octane numbers are_____
- A) n-heptane and iso-octane
 B) alpha methyl naphthalene and hexadecane
 C) hexadecane and isooctane
 D) n-heptane and hexadecane
- 27) In Nernst equation for the calculation of EMF of cell, Q_a represents _____
- A) quantum
 B) Einstein
 C) reaction quotient
 D) none of these
- 28) In chemical cell, EMF is due to_____
- A) different electrode concentration
 B) different electrolyte concentration
 C) chemical reaction
 D) both A) & B)
- 29) It is only the absorbed light radiations that are effective in producing a chemical reaction. This is the statement of_____
- A) Lamberts law
 B) Lambert - Beer law
 C) Grotthus - Draper law
 D) Stark - Einstein law
- 30) Which of the following are the reactions in which molecules absorbing light do not themselves react but induce other molecules to react?
- A) photosensitized reactions
 B) free radical reactions
 C) chain reactions
 D) reversible reactions

- 31) Betain intermediates is formed in _____ reaction.
- A) B.V. oxidation
C) Wittig
- B) Wagner-Meerwein
D) Hoffmann
- 32) The SeO₂ reagent is primarily used to oxidize _____ position.
- A) allylic
C) both A) and B)
- B) benzylic
D) neither A) nor B)
- 33) The molecule whose synthesis is being planned is called as _____
- A) target molecule
C) synthons
- B) new molecule
D) synthetic equivalent
- 34) Cinnamaldehyde can be prepared by _____ using benzaldehyde and acetaldehyde.
- A) Aldol condensation
C) Perk in reaction
- B) Claisen condensation
D) Diels-Alder reaction
- 35) Addition of halogen to triple bond hydrocarbons produces _____
- A) dihaloalkane
C) alcohol
- B) tetrahaloalkane
D) aldehyde
- 36) Addition of water to unsymmetrical alkyne leads to formation of _____
- A) ketone
C) alcohol
- B) carboxylic acid
D) aldehyde

- 37) Which of the following is not a natural product?
- A) terpenoids B) alkaloids
C) nanocomposite D) proteins
- 38) Isoprene may turn into rubber on_____
- A) heating at 280 °C B) on distillation
C) polymerization D) none of these
- 39) Decolorization of cane juice is done using_____
- A) activated carbon B) ion exchange resin
C) sulphitation process D) all of these
- 40) The density scale used to measure sugar concentration is_____
- A) trix B) brix
C) pan D) calendria
- 41) An ideal drug is expected not to induce_____
- A) resistance B) sleep
C) curative action D) all of these
- 42) Drug used as an antimalarial is_____
- A) proguanil B) isoniazide
C) phenobarbitone D) benzocaine

- 43) A polymers are grouped on the basis of their_____
- A) origin B) structure
 C) property D) any of theses
- 44) Conducting polymers carry_____
- A) extended conjugation B) doped impurities
 C) blending of conducting element D) any of these
- 45) The concept of matter wave was suggested by_____
- A) De - Broglie B) Schrodinger
 C) Laplace D) Heisenberg
- 46) The operator ∇^2 is called _____ operator.
- A) Poisson B) Laplacian
 C) Vector D) Hamiltonian
- 47) Flame photometry is concerned with the measurement of intensity of light_____ when a metal is introduced into the flame.
- A) absorbed B) emitted
 C) both A) and B) D) none of these
- 48) In simple flame photometers, the monochromator is _____
- A) grating B) slit
 C) prism D) all of these

- 49) The Nernst distribution law equation $C_1/C_2 = K_d$ applies when:
- A) the molecular state of the solute is the same in both the solvents
 - B) the molecular state of the solute is different in both the solute
 - C) the molecular state of the solute may be the same or different in both the solute
 - D) none of the above
- 50) The greater the distribution ratio in favour of the organic solvent, the _____ will be the amount extracted in any one operation.
- A) lesser
 - B) greater
 - C) equal
 - D) none of these
- 51) How many peaks will be observed in ^1H NMR spectrum of the following molecule?



- A) 1
 - B) 2
 - C) 3
 - D) 4
- 52) Which of the following solvent is not used for scanning NMR?
- A) D_2O
 - B) CHCl_3
 - C) CCl_4
 - D) CDCl_3
- 53) At what stretching frequency $\text{C}=\text{O}$ from saturated acyclic ketone depict band in IR spectrum?
- A) $1200\text{-}1250\text{ cm}^{-1}$
 - B) $2190\text{-}2200\text{ cm}^{-1}$
 - C) $1710\text{-}1720\text{ cm}^{-1}$
 - D) $3230\text{-}3550\text{ cm}^{-1}$

- 54) Which of the following molecule is IR active?
- A) CO
 - B) N₂
 - C) H₂
 - D) O₂
- 55) A compound with molecular formula C₄H₈O having δ value: 3.00 ppm (q, 2H), 2 ppm (s, 3H), 2.5 ppm (t, 3H). What is the possible molecular structure of this compound?
- A) CH₃-CH₂-CH₂-OH
 - B) CH₃-CH₂-CH₂-CHO
 - C) CH₃-CH₂-CO-CH₃
 - D) CH₃-CH(OH)-CH₃
- 56) Which primary standard is used in titrimetric analysis?
- A) potassium permanganate
 - B) sodium hydroxide
 - C) hydrochloric acid
 - D) none of the above
- 57) Which of the following is a characteristic of a chelating agent?
- A) forms covalent bonds with metal ions
 - B) decreases the solubility of metal ions
 - C) decreases the stability of metal ions
 - D) forms a ring structure with metal ions

- 58) Which of the following statements about ionization energy is correct?
- A) Ionization energy decreases from left to right across a period in the periodic table.
 - B) Ionization energy increases from left to right across a period in the periodic table.
 - C) Ionization energy decreases from top to bottom within a group in the periodic table.
 - D) Ionization energy increases from top to bottom within a group in the periodic table,
- 59) Which of the following elements has the highest electronegativity?
- A) sodium
 - B) chlorine
 - C) aluminium
 - D) neon
- 60) What is the charge on Ni in $\text{Ni}(\text{CO})_4$?
- A) 0
 - B) 1
 - C) 3
 - D) 4
- 61) Which one of the following can form dimer?
- A) $\text{Al}(\text{CH}_3)_3$
 - B) $\text{Cd}(\text{CH}_3)_2$
 - C) $\text{Zn}(\text{CH}_3)_2$
 - D) None of these
- 62) The IUPAC name of $\text{CH}_3\text{-Be-C}_2\text{H}_5$ is _____
- A) methylethylberyllium
 - B) dialkylberyllium
 - C) ethylmethylberyllium
 - D) none of these

- 63) Which one of the following is used as a catalyst for polymerization at industrial scale?
- | | |
|---|-----------------------------|
| A) $\text{Al}(\text{C}_2\text{H}_5)_3, \text{TiCl}_4$ | B) Fe_3O_4 |
| C) PdCl_2 | D) $\text{Ni}(\text{CO})_4$ |
- 64) Which of the following factor/s influence/s the activity of heterogeneous catalysts?
- | | |
|---------------------------|--------------------------|
| A) total surface area | B) method of preparation |
| C) number of active sites | D) all of these |
- 65) Which of the following theory is best suitable to explain the heterogeneous catalysis?
- A) Nucleate
 - B) Intermediate compound formation theory
 - C) Paratoid
 - D) Absorption theory
- 66) The radioisotope, 'x' has a half-life of 16 years. If the initial amount of 'x' is 400g, how many grams of it would remain after 64 years?
- | | |
|----------|--------|
| A) 12.5g | B) 25g |
| C) 50g | D) 80g |
- 67) The age determination of organic fossils using carbon dating method is based on the fact that
- A) C^{14} fraction is same in all objects
 - B) ratio of Carbon-14 and Carbon-12 is constant
 - C) C^{14} is highly insoluble
 - D) all of these

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- 68)** The Miller indices of the plane cuts the three axes at 2, -1 and ∞ are_____
- | | |
|--------------------|---------------------------------|
| A) (1 2 0) | B) (1 2 ⁻ 0) |
| C) (1 2 ∞) | D) (1 2 ⁻ ∞) |
- 69)** How many numbers of Cl⁻ ions in a unit cell of KCl are at the centre of edges which are shared by four cubes.
- | | |
|-------|------|
| A) 3 | B) 1 |
| C) 12 | D) 4 |
- 70)** The chemical reaction which proceed from reactant to product through one or more intermediates is called as _____ reaction
- | | |
|-------------|----------------|
| A) counter | B) side |
| C) parallel | D) consecutive |
- 71)** A heat engine working between 200 K and 400 K has _____ % efficiency
- | | |
|-------|-------|
| A) 30 | B) 40 |
| C) 50 | D) 60 |
- 72)** Oxygen on crystallization forms a perfect crystal. The entropy of oxygen at 0 K temperature is _____Joule
- | | |
|---------|-------------|
| A) 16 | B) 32 |
| C) zero | D) infinite |
- 73)** Which of the following is non-reducing sugar.
- | | |
|--------------|------------|
| A) galactose | B) glucose |
| C) lactose | D) sucrose |
- 74)** The methylation followed by oxidation for determination of ring size of D-glucose yields the final product _____
- | | |
|---------------------------------|------------------|
| A) xylotrimethoxy glutaric acid | B) osazone |
| C) glutaric acid | D) gluconic acid |

- 75) As per Huckel's rule planar, cyclic, conjugated compounds containing _____ electrons are aromatic in nature.
- | | |
|-------------|-------------|
| A) $4n$ | B) $2n^2$ |
| C) $4n - 1$ | D) $4n + 2$ |
- 76) Cyclopentadiene is _____ in nature.
- | | |
|------------------|-----------------|
| A) aromatic | B) non aromatic |
| C) anti aromatic | D) bicyclic |
- 77) _____ overlapping is not observed in benzene
- | | |
|------------------|---------------|
| A) $sp^2 - sp^2$ | B) $sp^2 - s$ |
| C) $sp - sp$ | D) $p - p$ |
- 78) The degree of freedom for a two component system, at congruent melting point is _____
- | | |
|----------|---------|
| A) one | B) two |
| C) three | D) zero |
- 79) The equilibrium system of decomposition of $CaCO_3$ involves _____ phases.
- | | |
|----------|--------|
| A) three | B) one |
| C) zero | D) two |
- 80) In standardisation of potentiometer, a standard cell having voltage _____ is generally used.
- | | |
|----------|------------|
| A) 1.5V | B) 1.018 V |
| C) 2.0 V | D) 2.508V |
- 81) The titrations in which end points are determined by emf measurement and precipitation occurs are called _____ titrations.
- | | |
|--------------|------------------------|
| A) redox | B) precipitation |
| C) acid-base | D) oxidation-reduction |

- 82) The vapour always contains relatively _____ proportion of the more volatile component than does the liquid phase
- A) less
B) equal
C) slight
D) more
- 83) Which of the following is not correct for an ideal solution?
- A) $\Delta S_{\text{mix}} = 0$
B) $\Delta H_{\text{mix}} = 0$
C) $\Delta V_{\text{mix}} = 0$
D) it's obeyed Raoult's law for entire concentration \range and temperature.
- 84) Azeotropic mixtures are _____
- A) mixtures that will boil at different temperatures
B) mixtures of two solids
C) constant boiling mixtures
D) both B) and C)
- 85) Critical solution temperature (CST) for nicotine-water system is
- A) lower 381K and upper 433K
B) upper 481 K and lower 333 K
C) upper 341K and lower 310 K
D) upper 420K and lower 320 K
- 86) The frequency of infrared radiation lies between _____
- A) visible and micro- waves
B) microwave and X-rays
C) microwave and Gamma rays
D) microwave and radio waves
- 87) The highest frequency electromagnetic radiations are _____
- A) Gamma rays
B) Infrared rays
C) Xrays
D) Radio wave

- 88) The base value for $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}-\text{CH}_3$ compound is _____
A) 246 nm B) 250 nm
C) 217 nm D) 230 nm
- 89) The possible transitions for water molecule in UV visible region are _____
A) $\sigma \rightarrow \sigma^*$ B) $n \rightarrow \sigma^*$
C) $n \rightarrow \pi^*$ D) None of these
- 90) Mass spectrometer separates ions on the basis of which of the following?
A) mass to charge ratio B) molecular weight
C) mass D) charge
- 91) The mass spectrum of $\text{CH}_3\text{COOC}_2\text{H}_5$ is not expected to show a major ion peak at which m/z ratio?
A) 88 B) 32
C) 15 D) 29
- 92) Carbohydrate is the term used to include _____
A) polyhydroxy aldehyde
B) derivatives of polyhydroxy aldehyde & ketone
C) polyhydroxy ketone
D) all of these
- 93) D-Glucose does not react with _____ reagents.
A) Fehling's B) Tollen's
C) Schiff's D) None of these
- 94) Which of the following complex ion is orange yellow in colour?
A) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ B) $[\text{Co}(\text{NH}_3)_6]^{3+}$
C) $[\text{CoF}_6]^{3-}$ D) $[\text{Ni}(\text{NH}_3)_6]^{2+}$

- 95) Ligands are considered as _____
- A) charged species B) point groups
C) point charges D) charged group
- 96) _____ is 123 superconductor.
- A) $\text{YBa}_2\text{Cu}_3\text{O}_7$ B) NaCl
C) CuSO_4 D) MgSO_4
- 97) Which of the following is intrinsic semiconductor?
- A) P B) Si
C) Ga D) As
- 98) In electrodeposition method, the nanoparticles are deposited on_____
- A) cathode B) any electrode
C) anode D) positive electrode
- 99) In hydrothermal method for synthesis of nanomaterial, the instrument in which reaction is carried out is called as _____
- A) furnace B) auto clave
C) water bath D) oven
- 100) What is a supersaturation?
- A) solution containing low amount of solute
B) solution containing equilibrium amount of solute
C) solution containing more amount of solute than normal circumstances
D) none of these.



Rough Work

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