UNIVERSITY OF MADRAS
DEPARTMENT OF ANALYTICAL CHEMISTRY
M.Sc. – Entrance Examination Syllabus.

Analytical Chemistry

Data Analysis, Principles of gravimetric analysis. Principles of volumetric analysis. Purification techniques – Solvent extraction and chromatographic techniques. Introduction to gas chromatography and HPLC. Surface and thermal analytical methods. X-ray methods and Bragg's equation. Atomic absorption, IR & UV and NMR spectroscopy. Basic principles of mass spectral analysis and instrumentation, polarography, potentiometer.

MODEL QUESTION PAPER (only objective type)   Marks: 25x1= 25

1. In gravimetric analysis, precipitates are washed with dilute electrolyte to avoid-----------------
2. In conductometry ---------------------- current is used
3. The quality of milk is tested with
    (a) Odometer   (b) Ammeter   (c) Lactometer   (d) Barometer
4. Among the following gases which is called as "laughing gas"
    (a) Ozone   (b) Nitrous Oxide   (c) He   (d) CO

Note: Entrance Examination question paper will contain 25 questions from analytical syllabus

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Head
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3/07/24

UNIVERSITY OF MADRAS
DEPARTMENT OF INORGANIC CHEMISTRY
M.Sc. – Entrance Examination Syllabus.
Inorganic Chemistry

Atomic structure principle of Inorganic Qualitative and Volumetric Analysis, Chemical Bonding Chemistry of S-block elements. d-block elements. Chemistry of f-block elements. Chemistry of organometallic compounds, Metallic bonding. Coordination Chemistry. Organometallic compounds. Applications of coordination compounds. Special type of compounds. Chemistry of Group IIIA and Group IV families. Chemistry of Halogen and Noble Gas families. Solid state and liquid crystals.

MODEL QUESTION PAPER (Only objective type)   Marks: 25 X 1 = 25

Section – A (10 x 1 = 10 Marks)

1. Which has the maximum number of unpaired electrons?
   (a) Mg^{2+} (b) Ti^{3+} (c) V^{3+} (d) Fe^{2+}

2. The rusing of iron is catalysed by
   (a) H_2O (b) O_2 (c) Zn (d) H^+

Section – B (15 x 1 = 15 Marks)

3. Ziegler-Natta catalyst is a mixture of ……………. and ………….

4. Write the Spectrochemical series ………………….

*Entrance Examination question paper will contain 25 questions from Inorganic Syllabus

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Alkanes and Cycloalkanes, Alkenes and Alkynes, Alcohols and Phenols, Ethers, Carbonyl Compounds-Preparation and Reactivity.
Carboxylic acid and its derivatives, Nitro compounds, Amines and Arene diazonium salts-Preparation and Reactivity. Chemistry of active methylene compounds and their reactivity. Stereochemistry: R, S and E, Z notation, Asymmetric Synthesis, Aliphatic Nucleophilic (S_N1, S_N2 and S_Ni mechanisms) and Electrophilic substitutions: Mechanism and applications. Aromaticity, Aromatic Nucleophilic and Electrophilic substitutions: Mechanism and applications. Friedel-Crafts alkylation and acylation and Vislmeier-Haack formylation reactions. Elimination (E1 and E2 mechanisms), Condensation and addition to carbon-carbon and carbon-oxygen double bonds. Molecular rearrangements: Pinacol-Pinacolane, Cannizzaro, Wager–Meerwein, Claisen, Cope, Beckman, Hofmann, Curtius and Benzil-Benzilic acid rearrangements. Oxidation and Reduction: Mn & Cr reagents; Per-acid; $LiAlH_4$, $NaBH_4$. H_2/Pd-C Catalyst; Clemmensen, Wolf-Kishner & Rosenmund reduction. Application of UV, IR, NMR and Mass for structure determination (up to C10). Carbohydrate Chemistry; Organic photochemistry; Cycloadditions: Carbene and Nitrenes. Heterocyclic Chemistry: Furan, Thiophene, Pyrrole, Indole, Pyridine, Quinoline and Isoquinoline-Synthesis and Reactivity. Natural products: Terpenes and alkaloids.

MODEL QUESTION PAPER: Objective Type (Marks: 25 x 1 = 25)

1. Among the following compounds (A-D), the one which is having 'Z' configuration:
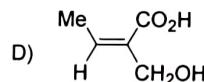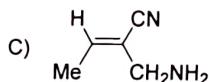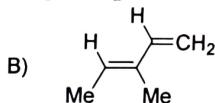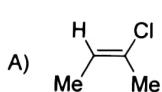
2. Conversion of silver salt of **alkyl carboxylic acid** into **alkyl halide** is known as:
   A) Hunsdiecker reaction   B) Finkelstein reaction   C) HVZ reaction
   D) Ritter reaction

3. The most suitable reagent to carry out **1,2-addition** of 2-cyclohexene-1-one
   A) MeLi/CeCl₃   B) MeLi   C) MeMgBr   D) Me₂CuLi

4. The correct **UPAC** name of the compound CH_3-CH_2-CH_2-$CH(CH_3)$-CH_2CH_3:
   A) 2-Ethylpentane   B) 3-Methylhexane
   C) 2-Propylbutane   D) 1-Ethyl-1-methylbutane

5. The β-naphthol will undergo **coupling reaction** with Ph-N=N-Cl most likely at:
   A) 2-Position   B) 1-Position   C) 3-Position   D) 4-Position

Entrance Examination question paper will contain 25 questions from Organic Chemistry Portion (B. Sc Organic Chemistry syllabus)

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04/07/2024

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University of Madras
Department of Physical Chemistry
M.Sc., Entrance Examination Syllabus

Quantum Mechanics- Atomic Structure and Spectra-Dual character of electron-Chemical bonding-MOT & VBT-Basic concept of group theory- Molecular Spectroscopy-Electric and Magnetic properties-Gaseous state-Chemical equilibrium- The law of mass action-Phase equilibria-Ionic equilibrium- Colligative properties of dilute solution-Electrochemistry-Chemical kinetics- Catalysis- Solid State-Colloidal state-Surface Chemistry-Mass spectrometry-Thermodynamics-Macromolecules-Photochemistry and related physical chemistry portion of B.Sc. Chemistry level.

Model Question Paper (only objective type)   **Marks: 25 X 1=25**

1. The time taken for 10% completion of a first order reaction is 20 min. then for 19% completion, the reaction will take
   (a) 40 mins   (b) 60 mins   (c) 30 mins   (d) 50 mins

2. Free energy change (ΔG) is related to the e.m.f of a cell (E) as

   (a) $\Delta G = - nFE/RT$ (b) $\Delta G = - (RT/nF) \times lnE$ (c) $E = - nF\Delta G$ (d) $\Delta G = - nFE$

3. The number of degrees of freedom in an aqueous solution containing starch and 0.01N NaCl according to Gibb's phase rule will be

   a) 4.0   b) 1.0   c) 2.0   d) 3.0

4. In which of the following cases does reaction not proceed spontaneously?
   (a) ΔH is +ve and ΔS is zero   (b) ΔH is –ve and ΔS is –ve

   (c) ΔH is +ve and ΔS is –ve   (d) ΔH is –ve and ΔS is +ve

5. Which of the following may show a pure rotational Raman spectrum

   (a) CH_4,   (b) H_2O' (c) CH_4 (d) CH_3Cl

<u>Note:</u> Entrance Examination question paper will contain 25 questions from Physical Chemistry Syllabus and each question carry one Mark.

02/03/2024

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