

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

**Analytical Chemistry**

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

**MODEL QUESTION PAPER (only objective type)**

**Marks: 25 x 1= 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

**Entrance Examination question paper will contain 25 questions from Analytical Chemistry Portion**

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**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 rusting of iron is catalyzed 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 Chemistry Syllabus**

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**UNIVERSITY OF MADRAS**  
**DEPARTMENT OF ORGANIC CHEMISTRY**  
**M. Sc Entrance Examination**  
**Organic Chemistry-Syllabus**

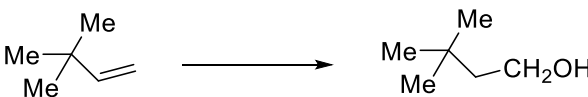
Alkanes and Cycloalkanes, Alkenes and Alkynes, Alcohols and Phenols, Ethers, Carbonyl Compounds-Preparation and Reactivity.

Carboxylic acid and its derivatives, Nitro compounds, Amines and Arene diazonium salts-Preparation and Reactivity.

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. 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: Marks: 25 x 1 = 25**

1. The **phenolic compound** among the following:  
A) Ibuprofen      B) Paracetamol      C) Penicillin      D) Camphor
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)  $MeLi/CeCl_3$       B)  $MeLi$       C)  $MeMgBr$       D)  $Me_2CuLi$
4. The most appropriate **reagent** to carry out the following transformation:  



  
A) Acid mediated hydration        
B) Hydroboration followed by oxidation  
C) Oxy-mercuration followed by  $NaBH_4$  reduction  
D) Ozonolysis followed by reduction

**Entrance Examination question paper will contain 25 questions from Organic Chemistry Portion**

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

Quantum Mechanics - de-Broglie hypothesis, Heisenberg uncertainty principle, Photoelectric effect - 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 - Thermodynamics - Molecular velocities- Macromolecules - Photochemistry - Petroleum - Corrosion.

**Model questions**

1. The limiting molar conductivity  $\lambda^{\circ}_M = \lambda^{\circ}_+ + 2\lambda^{\circ}_-$  is applicable to  
(a) NaCl (b) FeCl<sub>3</sub> (c) CaSO<sub>4</sub> (d) MgCl<sub>2</sub>
2. Calculate the root mean square velocity ( $C_{rms}$ ) of N<sub>2</sub> at 27°C.  
(a) 415 ms<sup>-1</sup> (b) 700 ms<sup>-1</sup> (c) 235 ms<sup>-1</sup> (d) 517 ms<sup>-1</sup>
3. 5.0 mol of an ideal gas is compressed from 1.0 to 6.0 atm at 27°C. Calculate  $\Delta G$ ?  
(a) 5.23 kJ (b) -15.21 kJ (c) 22.34 kJ (d) - 77.71 kJ
4. Calculate the energy of a photon of light of  $\lambda = 200$  nm  
(a)  $7.5 \times 10^{-12}$  J (b)  $19.7 \times 10^{-18}$  J (c)  $9.94 \times 10^{-19}$  J (d)  $5 \times 10^{-10}$  J
5. The conductance of 0.0075M KCl is  $1.49 \times 10^3$   $\mu$ mho. If the cell constant is 105 m<sup>-1</sup>, the specific conductance is  
(a)  $11.5 \times 10^{-5}$  mho m<sup>2</sup> mol<sup>-1</sup>  
(b)  $2.1 \times 10^{-2}$  mho m<sup>2</sup> mol<sup>-1</sup>  
(c)  $55.7 \times 10^{-7}$  mho m<sup>2</sup> mol<sup>-1</sup>  
(d)  $0.51 \times 10^{-3}$  mho m<sup>2</sup> mol<sup>-1</sup>
6. A Current of 500 ampere passing for one second is equal to  
(a) 0.000518 F/Sec.  
(b) 0.518000 F/Sec.  
(c) 0.051800 F/Sec.  
(d) 0.005180 F/Sec.
7. The vapour pressure of water of 1M NaCl and 1M KCl at the same temperature is  
(a) very different  
(b) nearly Equal  
(c) zero mm for both  
(d) equal to that of pure water

**Entrance Examination question paper will contain 25 questions from the Physical Chemistry Syllabus**

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