**DEPARTMENT OF PHYSICAL, NUCLEAR CHEMISTRY**

**AND CHEMICAL OCEANOGRAPHY**

**ANDHRA UNIVERSITY**

**M.Sc. (Final) Marine Chemistry**

**III-SEMESTER**

**PAPER–I: General Oceanography**

**UNIT-I**

History development and scope of Oceanography. Contribution of Challenger International Indian ocean expeditions and GEOSECS programme. Major oceanographic institutes in the world and India.International collaboration in Marine Science studies. Antarctica and Polymetallic nodule programmes of India. Law of the Sea.

**UNIT-II**

Elementary principles only of Physical Oceanography.Water circulation.Important water masses. Upwelling and sinking. Temperature structure of the water column.Air-sea interactions and heat budget of Oceans.Ocean physiographic features-shelf, Slope, Deep, Ridges, Canyons, Trenches, Submarine Volcanoes, Estuaries, Fjords and Deltas. Eustatic sea level changes.

**UNIT-III**

Elementary principals only of Biological Oceanography.Primary productivity and factors affecting it.Common tropical phytoplankton and zooplankton species Bacteria and its importance. Benthos foraminifera ecological considerations.

**THE FOLLOWING UNIT IS MEANT FOR ASSIGNMENTS ONLY**

**UNIT-IV**

Flux of materials across the sea water-sea bed interface. Fick’s of diffusion and their application in flux calculations. Marine sedimentary processes classification of sediments.Characteristics of near shore and Deep sea sediments. Sediment texture and triangular plot of sand –silt-clay. Composition and distribution of lithogenous, biogenous, hydrogenous and cosmogenous components. Major element chemistry of marine sediments and crystal earth trace metal enrichment before particle deposition.

**Text and Reference Books:**

# The Oceans: Their Physics, Chemistry, and General Biology by H. U. Sverdup, Martin W. Johnson and Richard H. Fleming. Asia publishing house Bombay 1961.

1. Introduction to Marine chemistry by J.P. Riley, Academic Press, London (1969).
2. Chemical Oceanography, by J.P. Riely and G. Skirrow (Editors). 2nd Edition. VOL 1 AND 2, Academic press, London. 1975 Relevant chapters (6, 7, 8, 9, 11, 12, 13, 14 and 18, 37).
3. The Indian ocean- A perspective , by R Sen Gupta and E Desa (Editors), Oxford & IRH (Pub), NEW DELHI, 2001, Chapter 4.
4. Petroleum formation and Occurrence: A new approach to oil and gas exploration by B.P Tissot and D.H. Welte, Springer-Verlag. Berlin, 1978.

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**M.Sc. (Final) Marine Chemistry**

**III-SEMESTER**

**PAPER–II: Chemical Oceanography**

**UNIT-I**

Salinity and Chlorinity, Chlorosity. Physical properties- electrical conductivity, specific gravity, compressibility and refractive index. Equation state of sea water. Marcet’s principle. Conservative and non-conservative behavior of major and minor elements. Residence Time- its computation, variability and importance. Surface residence time. Geochemical balance of Oceans. Mass Balance calculations- sodium balance. Excessvolatiles. Radioactive elements in the sea.

**UNIT-II**

Gas Exchange at surface. Reactive and non-reactive gases- sources and fluxes. Argon as a reference gas. Distribution of N2 and He. Dissolved Oxygen.A.O.U. Anoxic environments. H2S and alternation of associated elemental chemistry. Carbon dioxides system. Alkanity, Calcium Carbonate satuatrution and Compensation depths.

**UNIT-III**

Micronutrient elements- N,P and Si- their budgets and cycles. Nitrogen imbalance and denitrification. Trace metals (Cu, Zn, Ni, V, Cr, Mo, Sn, Mn, Fe and Cd) - their origin, distribution and fate. Water Mass identification using T-S diagrams, PO and NO plots. Inter-element relationships and ratios.

**THE FOLLOWING UNIT IS MEANT FOR ASSIGNMENTS ONLY**

**UNIT-IV**

Dissolved organic matter and particulate organic matter.Their origin, elemental and chemical composition, distribution and fate. Ectocrines, Extra cellular Metabolites and humic substances. Inputs, formation, and fate of suspended particles. Morphology and composition. Stokes Law of falling particles and its application in the sea. Degradation of organic matter under aerobic and anaerobic conditions.

Atypical conditions under which major elements are not conservative Oceanography of coastal environments, estuaries, lagoons and land locked basins and hydrothermal solutions.Bay of Bengal and Arabian Sea.

**Text and Reference Books:**

# The Oceans: Their Physics, Chemistry, and General Biology by H. U. Sverdup, Martin W. Johnson and Richard H. Fleming. Asia publishing house Bombay 1961.

1. Introduction to Marine chemistry by J.P. Riley, Academic Press, London (1969).
2. Chemical Oceanography, by J.P. Riely and G. Skirrow (Editors). 2nd Edition. VOL 1 AND 2, Academic press, London. 1975 Relevant chapters (6, 7, 8, 9, 11, 12, 13, 14 and 18, 37).
3. The Indian ocean- A perspective , by R Sen Gupta and E Desa (Editors), Oxford & IRH (Pub), NEW DELHI, 2001, Chapter 4.

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**M.Sc. (Final) MARINE CHEMISTRY**

**III-SEMESTER**

**PAPER–III: CHEMICAL METHODS IN MARINE CHEMISTRY**

**UNIT –I**

Errors in analytical measurements – Propagation of errors Accuracy and precision. Standard deviation Coefficient of Vanation and Confidence Limit Calibration – linear and multi-linear least squares. Detection and determination limits. Good Laboratory Practices. Control Charts – Shewha charts R charts.

**UNIT – II**

Sampling: General methods of collection, preservation, pretreatment and post treatment of water (including sewage and effluent) sediment an biological samples. Criteria of an ideal filtering medium – glas fibre membrane and nucleopore filters. Digestion methods. Sequential extractions.

**UNIT – III**

Matrix effects Interference effects. Preconcentration methods – co-precipitation, co-crystallisation, floatation, ion exchange, solvent extraction their principles and applications.

**THE FOLLOWING UNIT IS MEANT FOR ASSIGNMENTS ONLY**

 **UNIT-IV**

Chemical methods of analysis of marine samples by volumetric, gravimetric and Complexometric methods - their principles and major applications to sea water analysis. Methods of estimation of salinity, major elements dissolve oxygen, nutrients, trace metals and organic constituents.

**Text and Reference Books:**

1. Chemical Oceanography, Vol.3 by J. P. Rely and G. Skirrow (editors). Academic Press London, 1975.
2. Instrumental Methods of analysis by H. H. Willard, L. L. Merritt, Jr. J. H. Dean and F. A. Settle, Jr. CBS (pub), Delhi, 6th Edition, 1986.
3. Vogel’s Text Book of Quantitative chemical analysis John wlley & Sons Inc., New York, 199