**Syllabus for GU-ART ranking test for M. Sc. Marine Sciences program approved in BOS in Marine Science held on 25/10/2021**

Colligative properties of water - Lowering of vapour pressure and elevation of boiling point - freezing point depression - Specific heat of water – Solar radiations parts of electromagnetic spectrum, properties of Electromagnetic radiations, - Earth long wave radiation - Black body radiation – Conduction - convection and Radiation - Laws of thermodynamics - Newton's laws of motion and gravitation - Oceanic waves and tides – Viscosity - surface tension – Buoyancy - gravity – centrifugal and Centripetal forces - El Nino and La Nina- Indian monsoon, momentum and energy conservation theorems. Modulii of elasticity, Relation between pressure, volume and temperature in adiabatic process. Multiplication and division of vectors by scalars, Addition and subtraction of vectors. Winds, classification of sea surface waves based on causative forces. Meteorological instruments, absolute humidity, absolute temperature, specific humidity, mixing ratio, relative humidity, states of water and energy associated with change of state, weather and climate.

Atmospheric Pollution: Composition of atmosphere. Ozone gas, Carbon dioxide, Green house gases, Global warming, acid rain, photochemical smog. Structure of the atom, Periodic Table, Atomic and molecular masses, mole concept and molar concentrations, Radioactivity and isotopes, Chemical bonding, Theory of dilute solutions, Ionic equilibria – solubility product, Acids and bases, Oxidation and reduction, Redox potentials, Transition elements, First and second law of thermodynamics, Chemical kinetics, Chemical equilibrium, Electrochemistry. Environmental chemistry: Environment and Environmental pollutants; water pollution and soil pollution. Chemical, bonding and molecular structure, classification of elements and their properties, Organic chemistry – some basic principles and Techniques. Aldehydes, ketones and carboxylic acids. States of matter: gaseous state, liquid state and solid state; Thermodynamic state: enthalpy change, entropy change and Gibbs energy change; Hydrogen: dihydrogen, hydrides, water, hydrogen peroxide and heavy water; s – Block elements; p – Block elements.

Principles of ecology, trophic level, niche and energy transfer and pyramid, food chain and food web, primary, secondary and tertiary producers, autotrophy, role of light and nutrients, enzymes, chemo-autotrophy and heterotrophy, role of microbes, decomposition and oxidation process, production of organic matter, carbon dioxide cycle, anthropogenic sources, land sea interaction, greenhouse gases, deforestation; Reproduction in organisms, Life span, cell division, Types of Reproduction, Asexual and Sexual Reproduction, Events in Sexual Reproduction, Fertilization; Principles of inheritance and variation, Mendel's Laws of Inheritance, Law of Dominance, Segregation, Inheritance of Genes, Chromosomal Theory of Inheritance, Linkage and Recombination, Sex Determination, Mutation, Genetic Disorders, Mendelian Disorders, Cytoplasmic Inheritance; Molecular basis of inheritance**,** The DNA, Transforming Principle, RNA World, Replication, Transcription, Genetic Code, Translation, Regulation of Gene Expression, Molecular Diagnosis, Transgenic Animals, Ethical issues, Controversies in India regarding Patent and Bio-piracy.

Rocks: igneous, sedimentary and metamorphic rocks; rock cycle; igneous rocks: origin, classification, textures, structure, occurrences, some common igneous rocks; sedimentary rocks: formation, terminology based on grain size and shape, classification, texture, structures and common types of sedimentary rocks; metamorphic rocks: agents and types of metamorphism, metamorphic texture, structures and common metamorphic rocks. Economic mineral deposits: definitions of ore, gangue and grade of an ore. Common metals and their ores; processes of formation of mineral deposits (magmatic, hydrothermal, sedimentary, residual, placer, metamorphic and contact metasomatic) with examples; study of some most commonly occurring metallic and non-metallic minerals (physical properties, chemical composition and their industrial uses). Fossil fuels: coal; origin and types of coal; petroleum and natural gas; origin and migration of petroleum; formation of oil pools; oil traps. Geological structures: geometrical elements in rock structures, rock deformation, folds, faults, joints and unconformities. History of the earth: stratigraphy and paleontology; stratigraphic correlation; fossils, conditions for preservation of fossils, modes of fossilization and significance of fossils in geology; dating of geologic events; relative and absolute dating; fundamental principles of historical geology. Plate tectonics; plate boundaries; seafloor spreading; continental drift; interior of the earth. Geological hazards and disaster management: volcanoes, earthquakes, tsunami and flood hazards. Geology and environment: significance of environmental geology; greenhouse effect and global warming; sustainable development and conservation of natural resources; causes and mitigation of landslides and coastal erosion.

**Reference Books**


1. Physics for degree students ( 2014) C.L. Arora and P.S. Hemne, S. Chand Publishing, New Delhi.
2. El Nino, La Nina and Southern Oscillation , Vol 46, first edition (1989) S. Philander, Academic press, USA.
3. Waves, Tides and shallow water processes (1989) Joan Brown and Jerry Bearman, Elseiver.
4. An Introduction to Mechanics (2014) D. Kleppner and R. Kolenkov, Cambridge University Press.
5. Classical Mechanics (2013) P. V. Panat, Narosa Publishing.
6. Thermal Physics (1993) S.C . Garg, R.M. Bansal and C. K. Ghosh, TMH.
7. Heat and Thermodynamics (1997) M. W. Zemansky and R.H. Ditman, McGraw Hill.
8. Mathematical methods for Physics and Engineering (20016) K. F. Riley, M. P. Hobson and S. J. Bence, Cambridge University Press.
9. Mechanics (2013) D.C.Tayal, Himalaya Publication.
10. Meteorology Today: An Introduction to weather, climate and the Environment (1985), 2nd edition, Ahrens, St. Paul, West Publ. House.
11. Introduction to Dynamical Oceanography (1983), 2nd edition, S. Pond and G. L. Pickard, Butterworth – Heinemann Ltd.
12. Marine Pollution (1986) by R. B. Clark.
13. Environmental Chemistry (2006) by A.K. De.
14. Water Pollution (1994) by Sharma and Kaur.

15. Principles of Inorganic Chemistry (2017) by B. R. Puri, L. R. Sharma and K. C. Kalia
16. Principles of Physical Chemistry (2017) by B. R. Puri, L. R. Sharma and M. S. Pathania
17. Essentials of Physical Chemistry (2010) by A. Bahl, B. S. Bahl and J. D. Tuli
18. Chemistry Textbooks for Class XI (Part I & II) (2015) by NCERT, New Delhi
19. Ecology: Concepts and Applications (1998) by Manuel Molles
20. Biology Textbooks for Class XI (Part I & II) (2015) by NCERT, New Delhi
21. Biology Textbooks for Class XII (Part I & II) (2015) by NCERT, New Delhi
22. Petrology: Igneous, Sedimentary, and Metamorphic (2006) Harvey Blatt, Robert Tracy, Brent Owens: W. H. Freeman Publications.
23. Igneous and Metamorphic Petrology (2013) Myron G. Best John Wiley & Sons
24. Principles of igneous and metamorphic petrology (2009) Anthony R, Philpotts, Jay Ague: Cambridge University
25. Principles of Petrology (1973) Tyrrell, G. W.: Bi Publications Pvt. Ltd.
26. Genesis and the origin of coal and oil (1996) Trevor Major: Appologetics
27. Economic Geology-Principles and Practice (2011) Walter L Pohl: Wiley
28. Introduction to ore forming processes (2013) Laurence Robb John: Wiley and sons
29. India's Mineral Resources (1979) Krishnaswamy: Oxford and IBH Publishing Co.
30. Structural Geology (1977) Marland P Billings: Prentice Hall
31. A manual of problems in Structural Geology (2009) Gokhale N. W.: CBS.
32. Fundamentals of Structural Geology (2005) David D Pollard, Raymond C Fletcher: Cambridge University Press
33. Planet Earth, Cosmology, Geology and Evolution of Life and Environment (1992) Emiliani C.: Cambridge University Press
34. Principles of Geology (1978) Arthur Holmes: ELBS.
35. Principles of Stratigraphy (1990) Lemon R Y: Merrill Publishing Co.
36. Principles of Paleontology (2008) Michael Fote: Arnold I Miller-W H Freeman
37. Invertebrate Palaeontology (2004) Henry Wood: CBS Publishers and Distributors Pvt. Ltd.
38. Earthquakes (2006) Bruce. A: Bolt Mac Millan Edn. - Centinnial Update
39. Environmental Geology (2010) Edward A Keller: Prentice Hall 9th Edition
40. Environmental Geology an Earth Systems approach (2006) Dorothy Merritts: Fraklin and Marshall Mac Millan Edn 2nd Edition