

**PRE REGISTRATION ENTRANCE EXAMINATION FOR QUALIFYING Ph.D.
DEGREE PROGRAMME: SYLLABUS (2023 ONWARDS) –**

SUBJECT: GEOLOGY

Dynamic Geology: Solar system – outer and inner planets. – Hypotheses related to origin of the Earth; their merits and demerits. Relief features and their types – Ocean basins and Continents. Dating of rocks – Age of the Earth. Types, products and causes of Volcanoes.

Geomorphology & Geo-tectonics: Fundamental concepts – Geomorphic features of India – Characteristic features of various kinds of landforms developed by Wind. Ground water, Glacier, running water, Seas and Oceans – Application of Geomorphology in groundwater, mineral and oil exploration and engineering projects – Theories of plate tectonics, continental drift and sea floor spreading. Orogeny and orogenic cycles – Epirogeny and evolution of plateaus. Structural and tectonic features of India. Quaternary tectonics.

Marine Geology: Topography, characteristics and various features of ocean basin and origin of continental shelf, slope and sub marine canyons. Waves and currents-long shore, rip and turbidity currents. Echo sounding, seismic shooting, seismic refraction and reflection. Physical and chemical properties of ocean water. Oceanographic instruments pertaining to geological operations. Sediment and water samplers. Classification of coral reefs and their characteristics. Theories of atoll formation. Eustatic sea level changes. Tsunami: origin and prediction. Ocean pollution. Natural mineral resources of the ocean. Plate tectonics and origin of ocean basins. Law of the sea and its implications.

Structural Geology: Mechanical principles – Description. Classification. Recognition. Mechanics and Causes of Folds, Faults, Joints & Unconformities – Distinction of Unconformities from faults and their use in dating structural events, Deformation Structures, - Modes of representation of joints – Histogram, rose diagram and preparation of stereogram. Cleavage, Schistosity and Lineation – their description. Origin and relation to major structures. Petrofabric analysis – Field and laboratory techniques. Petrofabric diagrams and their interpretation. Classification and characteristics of Tectonites, Diapirs and related structural features. Topographic maps, Field equipments, preparation of Geologic maps and report.

Stratigraphy: Principles – Standard Geological Timescale – Nomenclature and classification: Lithostratigraphy, Biostratigraphy, Chronostratigraphy and Stratotypes. Pre Cambrian formation in India – Cuddapah and Vindhyan super groups – Cambrian of Salt Range – Permian – Carboniferous of Salt Range Tiruchirapalli and Narmada. Deccan traps – inter and infra traps – Siwaliks – Tertiary and Quaternary formations – Age problems in India pertaining to Saline series and Deccan traps. Boundary problems in India with reference Precambrian – Cambrian, Permian – Triassic and Cretaceous – Tertiary. Sequence stratigraphy and basin analysis.

Palaeontology: Definition of fossil – Nature and modes of preservation of fossils – uses of fossils, index fossils, trace fossils. Organic Evolution – History of the concept of evolution – Darwin principles – Orthogenesis. Detailed morphology, evolution and stratigraphic importance

of the following groups. Corals, Graptolites, Trilobites, Pelecypods, Gastropods, Echinoids, Brachiopods and ammonites. Evolution of plants through ages – Gondwana flora and their stratigraphic significance. Principal groups of vertebrates through geologic time – Devonian fishes and Mesozoic reptiles. Evolutionary history of Horse, Elephant and Man. Micropalaeontological techniques – Sampling methods, separation of distribution and uses of metalliferous and industrial mineral deposit in India.

Physical, optical and rotation properties of ore minerals – A concise account of principles, field equipment's and techniques, data interpretation, applications and limitations of various geophysical exploration methods – Origin and abundance of elements in the earth's crust – geochemical anomaly – Application of geochemistry in Mineral exploration, Oil prospecting, Ground water targeting, Soil studies. – Brief outline of analytical methods of igneous rocks.

Engineering Geology: Engineering properties of rocks. Properties of building stones, concrete aggregates and rail road ballast. Earth movements and preventive measures. Geological investigations of sites for various types of dams-Dam construction – problems – remedial measures. Spillways, reservoir problems. Geological investigations for harbours, docks, coastal erosion and protection.

Mining Geology: Mining terms and their descriptions. Sampling techniques and principles. Types and methods of drilling and geological logging. Factors controlling the choice of various mining methods. Alluvial, open cast and sub surface mining methods and mine machineries. Explosives used for mining. Assaying and evaluation of ore bodies and their extensions. Ore reserve estimation. Mining hazards and preventive measures.

Photo Geology, Remote Sensing and GIS: Types of aerial photographs. Photographic scale – causes for variation. Flight planning. Parallax. Vertical Exaggeration. Stereoscopy and stereoscopes. Study of aerial photos using stereoscopes. Mosaics: Types and construction. Remote sensing: definition. Energy interaction with atmosphere and earth's surface features. Types of satellites. Sensors and their resolutions. Data acquisition. Receiving and recording. Photographic and digital characteristics of Landsat, SPOT, IRS series of satellites and other high-resolution satellites. Indian space programme: past, present and future. Elements of photo and image interpretation, interpretation strategies and keys.

Environmental Geology: internal and external sources – Mass extinction through geologic time-Major climatic changes through Geologic time – Natural hazards due to river flooding. Soil erosion, mass movements, earth quake, volcano, sea water intrusion, coastal flooding and tsunami: their causes and governing/influencing factors, role of Geology in strategies for reduction/prevention/mitigation.

Reference and Textbooks:

- Akhtar, A. (2016). The DBS handbook of mineralogy and petrology. New Delhi: DBS
Anthony, M. Evans. (2012). Ore Geology and industrial minerals; An Introduction, 3rd Eds. Wiley India Pvt. Ltd. New Delhi.
Arogyaswamy, R. N. P. (2017). Course in mining geology, 4th Eds. CBS Publication. New Delhi.

Bangar, K.M. (2016). Principles of engineering and geology. New Delhi: Standard publishers distributors.

Bell, F.G. (2007). Engineering geology (2nd ed.). Amsterdam: Butterworth-Heinemann.

Bilwa, L.M. (2017). Paleontology: A practical manual. New Delhi: Studera Press.

Burrough, P.A., McDonnell, R., & Lloyd, C.D. (2015). Principles of geographical information systems (3rd ed.). New York: Oxford University Press.

Chahar, B. R. (2015). Groundwater hydrology. New Delhi:

Chandra, A.M., & Ghosh, S.K. (2015). Remote sensing and geographic information system (2nd ed.). New Delhi: Narosa Publishing House.

Chernicoff, S., & Whitney, D.L. (2007). Geology: An introduction to physical geology. Upper Saddle River, NJ: Pearson Prentice Hall.

Chidambaram, S. (2018). Groundwater: Hydrogeochemical investigations of using integrated technique. New Delhi: My Research Publications.

Davie, T., & Quinn, N. W. (2019). Fundamentals of hydrology. London:

Dexter Perkins. (2017). Mineralogy (3rd ed.). Noida: Pearson India Education Services Pvt.

Dexter Perkins. (2013). Mineralogy (3rd ed.). New Delhi: PHI Learning Pvt.

Doren, K. L. (2016). Air pollution. New Delhi: CBS Publication.

Dwivedi, R.S., & Roy, P.S. (2016). Geospatial technology: For integrated natural resources management. Chennai, Tamil Nadu, India: Yes Dee Publishing Pvt.

Ehlers, E.G., Blatt, H. (1999). Petrology: Igneous, sedimentary, and metamorphic. CBS Publication. New Delhi.

Elangovan, K. (2006). GIS: Fundamentals Application and Implementations. New Delhi: New India Publishing Agency.

Fletcher, C. H. (2017). Physical geology: The science of Earth. Hoboken, NJ: John Wiley & Sons.

Guhey, R. (2018). Geology: Principles and practical manual. New Delhi: New India Publishing Agency.

Ford, W. E. (2006). Dana's textbook of mineralogy (4th ed.). New Delhi: CBS Publication.

Gokhale, N. W. (2012). A manual of problems in structural geology. CBS Publication. New Delhi.

Gokhale, N. W. (2013). Fundamentals of sedimentary rocks. CBS Publication. New Delhi.

Gokhale, N.W. (1996). Exercise on geological and dip-strike problems. CBS Publication. New Delhi.

Gribble, C. D. (2005). Rutley's elements of mineralogy (27th ed.). New Delhi: CBS Publication.

Hara, K. D. (2018). A brief history of geology. Cambridge University Press.

Jain, P.C., & Anantharaman, M.S. (2015). Paleontology (Paleobiology) Evolution and Animal

Klein, C., & Dutrow, B. (2008). Mineral science (23rd ed.). New Delhi: John Wiley & Sons.

Kramer, S.L. (2014). Geotechnical earthquake engineering. Harlow: Pearson Education.

Krishnan, M.S. (2010). Geology of India and Burma (6th ed.). New Delhi: CBS Publication.

MacLane, M. (1995). Sedimentology. Oxford Univ. Press. New York.

Mahapatra, G. B. (2016). A textbook of geology. New Delhi: CBS Publication

Mathur, S.M. (2010). Elements of geology. New Delhi: PHI Learning Pvt.

McConnell, D. (2018). The good Earth: Introduction to earth science. New York: McGraw Hill.

Chaturvedi, M. C. (2012). India's waters. Boca Raton, FL: CRC Press.

Nichols, G. (2012). Sedimentology and Stratigraphy 2nd Eds. Wiley India Pvt. Ltd. New Delhi.

Paarikh, S. S. (2017). Sedimentary rocks in the field. Random Publications. New Delhi.

Pettijohn, F.J. (2004). Sedimentary rocks 3rd Eds. CBS Publications. New Delhi.

Routledge. Grughanam, B. (2009). Essentials of Hydrogeology, New Delhi, New India Publishing

Sengupta, S. M. (2016). Introduction to sedimentology 2nd Eds. CBS Publication. New Delhi.

Tyrrell, G. W. (1958). The earth and its mysteries. London: G. Bell.