SYLLABUS FOR THE POST OF MINING INSPECTOR.

1. PHYSICALGEOLOGYANDGEOMORPHOLOGY:-

Introduction to geology and its scope; Earth and solar system: origin, size, shape, mass, density and its atmosphere; A brief account of various theories regarding the origin and age of the earth; Brief idea of interior of earth and its composition; Weathering, Mass wasting and erosion: factors, types and their effects; Soil: development and types; Earthquakes: nature of seismic waves, their intensity and magnitude scale; Origin and prediction of earthquake; Earthquake Zones of India; Volcanoes: types, products and causes of volcanism; Basic principles of Geomorphology; Geomorphic mapping-tools and techniques; Endogenic and Exogenic processes; Diastrophism; Geological work of wind, glacier, river, underground water and ocean; Drainage Pattern: Development, analysis of stream activity and its relation to the structures; Elementary idea of continental drift, sea-floor spreading and mid-oceanic ridges; Paleomagnetism and its application; Plate Tectonics: the concept, plate margins, orogeny, deep sea trenches, island arcsand volcanic arcs; Long-term landscape evolution models.

2. MINERALOGY:

Definition and scope of mineralogy; Physical characters of minerals depending upon specific gravity, light, heat, electricity and magnetism; Classification of minerals; Isomorphism, Polymorphism, Pseudo orphism; Study of physical and chemical properties, classification, occurrence and uses of following groups of minerals and their species: Silica family, Feldspar family, Feldspathoids; Study of physical and chemical properties, classification, occurrence and uses of following groups of minerals and their species: Olivine, Pyroxene, Amphibole, Mica; General Principles of optics; elements of optics; Isotropism and anisotropism; General idea about refractive index, double refraction, extinction, pleochroism and interference colours.

3. STRUCTURAL GEOLOGY:-

Introduction to Structural Geology; contours, topographic and geological maps; Clinometer / Brunton compass and its use; Elementary idea of bed, dip and strike; Elementary idea of types of deformation; Stress and Strain in rocks, Strain ellipses of different types and their geological significance; Planar and linear structures; Concept of dip and strike; Outcrop patterns of different structures; Folds: nomenclature and types of folds; Introduction of the mechanics of buckling, bending, flexural slip and flow folding; Faults: nomenclature, geometrical and genetic classifications, normal, thrust and slip faults; Definition of Window, Klippe and Nappe; Types and significance of joints and unconformity; Description and origin of foliations: axial plane cleavage and its tectonic significance; Description and origin of lineation and relationship with the major structures.

4. PETROLOGY:-

Igneous Petrology:- Heat flow; geothermal gradients through time; origin and nature of magma; Magma: definition, composition, types and origin; Classification of igneous rocks; textures and structures of igneous rocks; Reaction principle; Differentiation and Assimilation; Crystallization of unicomponent and bicomponent (mix-crystals); Bowen's reaction series; Mineralogical and chemical classification of igneous rocks Magmatism in the oceanic domains (MORB, OIB); Magmatism along the plate margins (Island arcs/continental arcs); Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Peridotite, Diorite, Gabbro, Basalt.

Sedimentary Petrology: Grain size scale, particle size distribution, particle shape and fabric; Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks; Fluid flow, sediment transport and sedimentary structures; Types of fluids, Laminar vs. turbulent flow; Particle entrainment, transport and deposition; Paleocurrent analysis; Paleocurrents for different sedimentary environments; Sedimentary structures: Primary and syn-sedimentary structures; Concepts of diagenesis, Stages of diagenesis Compaction and cementation; Petrographic details of important silica clastic and carbonate rocks such as- conglomerate, breccia, sand stone, greywacke, shale, limestone.

Metamorphic Petrology: Process and products of Metamorphism; Type of metamorphism; Factors, zones and grade of metamorphism; Textures, structures and classification of metamorphic rocks; Metamorphic zones and isograde; Concept of metamorphic facies and grade; Mineralogical phase rule of closed and open system; Migmatites and their origin; Petrographic details of some important metamorphic rocks such as - slate, phyllite, schist, gneiss, quartzite, marble.

5. STRATIGRAPHY AND PALEONTOLOGY:-

Fundamentals of litho-, bio- and chrono-stratigraphy Introduction to concepts of dynamic stratigraphy (chemostratigraphy, seismic stratigraphy, sequence stratigraphy); International Stratigraphic Code – development of a standardized stratigraphic nomenclature; Concepts of Stratotypes, Global Stratotype Section and Point (GSSP); Brief introduction to the seismic stratigraphy, chemo-stratigraphy, Magneto-stratigraphy; Brief introduction to the physiographic and tectonic subdivisions of India.

Geology of the Dharwar Supergroup, Cuddapah Supergroup and Vindhyan Supergroup in their type area;Distribution of Palaeozoic rocks in India;Palaeozoic of Kashmir and its correlatives from Spiti and Zanskar, Gondwana Supergroup; Distribution of Mesozoic rocks in India, Triassic of Spiti, Jurassic of Kutch Cretaceous rocks of Trichinopoly and Pondicherry, Baghbeds and Lameta formation, Deccan traps-inter trappean, Shiwaliks Supergroup, Subathu, Dharamshala, Dagshai and Kasauli Groups, Karewabeds of Kashmir; Volcanic provinces of India - Deccan, Rajmahal, Sylhet Trap.

Palaeontology: Nature and importance of fossil record; Fossilization processes and modes of preservation; Species concept with special reference to paleontology, Taxonomic hierarchy Theory of organic evolution interpreted from fossil record; Brief introduction to important invertebrate groups (Bivalvia, Gastropoda, Brachiopoda) and their biostratigraphic significance; Significance of ammonites in Mesozoic biostratigraphy and their paleobiogeographic implications; Functional adaptation in trilobites and ammonoids; Origin of vertebrates and major steps in vertebrate evolution. Mesozoic reptiles with special reference to origin diversity and extinction of dinosaurs Evolution of horse and intercontinental migrations. Human evolution; Gondwana Flora; Introduction to Ichnology; Application of fossils in Stratigraphy Biozones, index fossils, correlation; Role of fossils in sequence stratigraphy Fossils and paleoenvironmental analysis Fossils and paleobiogeography, biogeographic provinces, dispersals and barriers Paleoecology – fossils as a window to the evolution of ecosystems

6. **GEOCHEMISTRY:-**

Introduction to geochemistry: basic knowledge about crystal chemistry; Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids; Elementary idea of Periodic Table; Cosmic abundance of elements; Composition of the planets and meteorites; Geochemical evolution of the earth and geochemical cycles; Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks; Elements of geochemical thermodynamics; Isomorphism and polymorphism; Concept of radiogenic isotopes in geochronology and isotopic tracers;Mineral reactions- diagenesis and hydrothermal reactions; Aqueous geochemistry- basic concepts and speciation in solutions, Eh, pH relations.

7. **PHOTOGEOLOGY, REMOTE SENSIING AND GIS:-**

Elementary idea about Photogeology: electro-magnetic spectrum, types and geometry of aerial photographs; factors affecting aerial photography; Fundamentals of remote sensing; remote sensing systems; remote sensing sensors; spectral signatures of rocks, minerals and soils; Application of remote sensing in geosciences and geomorphological studies; Types of Indian and Foreign Remote Sensing Satellites; Digital Image Processing, Image Errors, Rectification and Restoration, FCC, Image Enhancement, Filtering, Image Ratioing, Image classification and accuracy assessment; Introduction to Geographic Information System (GIS); components of GIS; Data formats – Raster and Vector; tools for map analysis; integration of GIS with remote sensing; Concepts of GPS Integrating GPS data with GIS Applications in earth system sciences.

8. **APPLIED AND ECONOMIC GEOLOGY:-**

Economic Geology its definition, scope and terminology; Ores, gangue minerals, tenor, grade and lodes; Definitions of Resources and Reserves; Syngenetic - Epigenetic minerals deposits; Classification of mineral deposits, Oxidation and Super gene enrichment; Mechanical and residual concentration; Physical properties, chemical composition, mode of occurrence, Geographical and Geological distribution and use of the following Ore deposits of India-Iron, Manganese, Copper, Lead, Zinc, Aluminium, Mica, Magnesite, Gypsum.

Elements of magnetic, electromagnetic, radiometric and seismic methods of mineral exploration; Principal methods of geological prospecting; Introduction of mining methods-Opencast and underground mining; Brief idea about the application of remote sensing in exploration investigation.

9. **HYDROGEOLOGY:-**

Hydrological Cycles-Distribution of water on earth crust Types of Ground Water, meteoric water, juvenile and magmatic waters; Characters of Zones of aeration, saturation and Water table; Classification of aquifer - Unconfined, confined, leaky and bounded aquifers; Run off, Rainfall, evaporation and Transpiration; Hydrogeological properties of rock and soil, permeability and porosity their relations to ground water motions, Its determination in lab and field; Transmissivity, storativity specific yield, specific retention and diffusivity; Surface investigations: Geophysical exploration, electric resistivity, seismic, gravity and magnetic methods; Sub-surface investigations of ground water: electrical, traditional and allied logging methods, test drilling; Fluctuations of water level and its causes; Quality of groundwater–chemical analysis; Principles governing ground water movement, Darcy's law, its application range, validity, Reynold's number and its application, Wellhydraulics and water wells, methods of constructing shallow and deep wells, Various recharging methods with Indian examples, Spring wells, origins, classification, distribution and important hot water springs in India.

10. **ENVIRONMENTAL GEOLOGY:**

Fundamental principles of environmental geology, its definition and scope, Geologic hazards, Landslides, its causes and remedial measures, prevention and identification Earthquakes hazard, its causes and remedies, Predications of Earthquakes, Construction in earthquakes prone area, Volcanic hazards, its causes and remedies, Atmosphere, its pollution, causes and remedies. Deforestation and causes and effects, Basic idea about global warming and its future projections, Water pollution, pollutants and remedies, Elementary idea of water quality and destructive effects of water pollution, Waste disposal and its management.

11. ENGINEERING GEOLOGY:

Site investigation and characterization; Foundation treatment; Grouting, Rock Bolting and other support mechanisms; Intact Rock and Rock Mass properties Rock aggregates; Significance as Construction Material; Concept, Mechanism and Significance of Rock Quality - Designation (RQD) Concept, Mechanism and Significance of: Rock Structure Rating (RSR), Rock Mass Rating (RMR), Tunnelling Quality Index; Geological, Geotechnical and Environmental considerations for Dams and Reservoirs; Tunnels and Tunnelling Methods; Landslides; Causes, Factors and corrective / Preventive measures; Earthquakes; Causes, Factors and corrective / Preventive measures.

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