

## 67. GEOLOGY

### Part - A (40 Marks)

**Palaeontology:** Definition of paleontology, conditions of fossilization, modes of preservation, and uses of fossils. Phylum Echinodermata and Phylum Brachiopod, Phylum Mollusca\* and Phylum Arthropoda\* Study of the following fossils with respect to their classification, morphology, and geological distribution: Cidaris, Micraster, Holaster, Hemiaster, Terebratula, Spirifer, Rhynchonella, Productus, Turritella, Murex, Cypraea, Natica, Voluta, Pecten, Gryphaea, Glycimeris, Arca Cardita, Exogyra, Nautilus, Ammonoids, Bellemnites, Calymene, Paradoxide. Plant fossils glossopteris, gangamopteris, ptylophyllum. **Indian Geology:** Definition of stratigraphy, principles of stratigraphy, standard geological time scale. Physiographic divisions of India with their stratigraphic and structural characteristics. Dharwar system, Cuddapah system; Vindhyan system; Kurnool system and Gondwana System. Triassic of Spiti, Jurassic of Kutch, Cretaceous of Tiruchinapalli, Deccan Traps and their Age, Siwaliks with vertebrate fossils, Archaean – Proterozoic boundary problem and Cretaceous – Tertiary boundary problem. Geology of Andhra Pradesh. **Economic Geology:** Definition of Economic geology, mineral resources and mineral deposit; importance of economic minerals and rocks; ore minerals, gangue minerals (gangue), ore, industrial minerals, tenor and grade; syngenetic deposits, epigenetic deposits. Classification of mineral deposits - Bateman's classification modified by Jensen. Processes of formation of mineral deposits; endogenetic and exogenetic processes - cavity filling and replacement, sedimentation; residual and mechanical concentration; oxidation and supergene enrichment. Study of ore deposits of gold, copper, lead, zinc, aluminum, iron, manganese, chromium, uranium and thorium, with respect to their mineralogy, uses, mode of occurrence (forms), origin and distribution in India of the industrial minerals and rocks required for the following industries; Abrasives, Cement, Ceramic & Glass, Fertilizers and Chemicals, Insulators, Refractories and Fluxes. Fuels (Coal, Oil and natural gas) - their origin, occurrence and distribution in India, Major mineral resources of Andhra Pradesh. Asbestos, Baryte, Bauxite, Coal, Clays, Gemstones, Limestone, Manganese, Mica., Oil and Natural gas.

### Part - B (60 Marks)

**Physical Geology:** General aspects, Definition of geology - Basic assumptions of Geology. Its relationship with other sciences - Branches of geology Aim and applications of geology. Earth as a planet - its shape, size, density - movements and their effects. Origin and age of earth. Geological processes - exogenic and endogenic, Definition of weathering - Types of weathering of rocks- Physical and Chemical; Definition of erosion and denudation, cycle of erosion; erosion, transportation and deposition; agents of erosion. Rivers: Erosion, transportation and deposition of river (fluvial) cycle in different stages - Development of typical land forms by river erosion and deposition. V-shaped valley, waterfall, alluvial fans, meander, ox-bow lake - flood plain, natural plain, peneplain and deltas Types of rivers, Glaciers: Definition of a glacier - types of glaciers - development of typical land forms by a glacial erosion and deposition - cirque, U-Shaped valley - hanging valley, Roches - moutonnées. Moraines, drumline, kames-Eskers and Varves, Characteristic features of glaciated regions, groundwater - storage of ground water - porosity permeability, aquifer, water table - zone of saturation, artesian well, spring, geysers - development of typical land forms by erosion and deposition by groundwater (Karst topography) sinkhole, cavern, stalactites and stalagmites. Seas - Offshore profile - continental shelf- Continental slope. Abyssal plane, deep-movement of sea water- tides-currents, waves, development of typical land forms by sea erosion and deposition coral reefs. Lakes-origin of lake basins, geological importance of lakes, lacustrine deposits. Wind: Development of Characteristic features by winds (arid cycle) erosion and deposition-pedestal rock-mushroom topography- Inselberg-ventifacts - loess - sand dunes. Earth movements - definition of diastrophism, epirogenic and orogenic movements. Earthquakes: Cause, kinds of earthquake waves, mode of propagation, intensity of earthquakes, Richters scale seismograph and seismogram. Effect of earthquakes, earthquake zones. Interior of the earth - structure and constitution, Volcanoes - parts of a typical volcano, products of Volcanoes, Origin of volcano. **Crystallography:** Definition of crystal - amorphous and crystalline, States, Morphology of crystals - face, edge, solid angle interfacial angle. Forms: Simple, combination, closed and open forms. Symmetry: Plane, axis, centre, Crystallographic axis, Parameters, indices; crystallographic notation - parameter. System of Weiss, index following

classes of symmetry. I. Cubic system - Normal (Galena) II. Tetragonal system - Zircon type III. Hexagonal system - Beryl type IV. Trigonal system - Calcite type V. Orthorhombic system - Barytes type VI. Monoclinic System - Gypsum type VII. Triclinic system - Axinite type. Twinning in crystals - Definitions of twin, twin plane, twin axis, composite plane. **Mineralogy:** Definition of a mineral - Classification of minerals into rock forming and ore forming minerals. Physical properties of minerals - colour, streak, play of colours, opalescence, asterism, transparency, lustre luminescence, fluorescence, form hardness, tenacity, cleavage parting, fracture; specific gravity, magnetic properties, Electric properties, pyro and piezo-electricity. Modes of Mineral formation: Occurrence and association of Minerals. Chemical properties of minerals - isomorphism, solid solution, polymorphism, allotropy, pseudomorphism, radio-activity; silicate structure. Descriptive of the following mineral groups: Nesosilicate (Olivine, Garnet, Aluminum Silicates) Sorosilicate (Epidote) Cyclosilicate (Beryl) Inosilicate (Pyroxene; Amphibole) Phyllosilicate (Mica, Hydrous magnesium silicate) Tectosilicate (Feldspars, Feldspathoids) Miscellaneous: Staurolite, Tourmaline, Zircon, Calcite, Corundum, Apatite. **Optical Mineralogy:** Optical properties of minerals - Isotropic and anisotropic substances - Polarized light refractive index, double refraction, uniaxial and biaxial minerals - Nicol Prism and its construction - concept of crossed Nicols. Petrological microscope (polarising) - its mechanical and optical parts - behaviour of isotropic and anisotropic minerals between crossed nicols - extinction, pleochroism, interference colour. optical properties of important minerals. **Petrology:** Nature and scope of petrology - definition of rock classification of rocks into igneous, sedimentary metamorphic. Distinguishing features of three types of rocks. **Igneous rocks:** Classification into plutonic, hypabassal and volcanic rocks; Forms- Lava flows, Intrusions, sills, laccolith, lopolith, dykes ring dykes, cone sheets volcanic necks, phacoliths and batholiths. Structures - vesicular, amygdaloidal, block lava ropy lava pillow, flow, jointing and sheeting structures. Plates, columnar and prismatic. Textures - Definition of textures, micro-textures, devitrification, allotrimorphic, hypidiomorphic, paniidiomorphic, porphyritic, poikilitic, ophitic, intergranular, intersertal, trachytic, graphic and micro-graphic textures. Reaction structures - corona, myrmekitic, orbicular, spherulitic, perlitic. Classification of igneous rocks - CIPW and Tyrrell tabular classification. Descriptive study of following rock types: Granite, Granodiorite, Syentie, Nepheline syenite, Diorite porphyry. Pegmatite, Aplite, Gabbro, Anorthosite, Peridotite, Pyroxenite, Dunite, Dolerite, Rhyolite, Obsidian, Trachyte, Andesite and Basalt. Composition and constitution of magma -Crystallization of Magma, uni-component binary system, eutectic and solid solutions. Origin of igneous rocks - Bowen's reaction principle, differentiation and assimilation. **Sedimentary Rocks:** Sources of sediments - mechanical and chemical weathering modes of transportation, sedimentary environments. Definitions of diagenetic lithification and cementation, stratification, Sedimentary structures, Types of bedding, surface marks, deformed bedding, solution structures. Classification of sedimentary rocks: clastic - rudaceous, arenaceous, argillaceous, non-clastic - calcareous, carbonaceous, ferruginous, phosphatic, evaporites. Descriptive study of the following sedimentary rocks-Conglomerate, Breccia, sandstone, Grit, Arkose, Graywacke, Shale, Limestone, shelly limestone. **Metamorphic Rocks:** Definition of metamorphism, agents of metamorphism, type of metamorphism, grade and zones of metamorphism, Metamorphic minerals - stress and antistress minerals. Structures of metamorphic rocks - Cataclastic, maculose, schistose, granulose and gneissose. Textures of metamorphic rocks - crystalloblastic, palimpset, xenoblastic, idioblastic, Classification of metamorphic rocks - concept of metamorphic facies. Cataclastic metamorphism of argillaceous and arenaceous rocks. Thermal metamorphism of argillaceous, arenaceous and calcareous rocks. Dynamothermal metamorphism of argillaceous, arenaceous and igneous rocks. Plutonic metamorphism, metasomatism and additive processes. Drfiniton of anatexis and palingenesis, Descriptive study of the following metamorphic rocks: - Gneiss, schist, slate, phyllite, quartzite, marble, granulite eclogite amphibolites migmatite. Indian examples - Gondite, Charnockite and Khondalite. **Structural Geology:** Definition of structural geology, aim and objectives of the structural Geology, Attitude of beds - strike, dip and apparent dip; use of clinometer, Primary Structures as Folds - description, nomenclature of folds, recognition of folds in the field. Joints - geometrical and genetic classification of joints. Faults - geometrical and genetic classification of faults, recognition of faults in the field effects of faults on the outcrops. Unconformities - definition of unconformity - types of unconformities, recognition of unconformities in the field distinguishing the faults from unconformities. Definition of overlap, offlap, outlier, inlier, cleavage, schistosity; foliation and lineation.