Appendix to UO No. Acad/C2/3999/2007 Dated 21/08/2007

KANNUR UNIVERSITY

B.Sc. (GEOLOGY) DEGREE EXAMINATION

SCHEME OF EXAMINATION AND SYLLABUS

FROM 2007 ADMISSION ONWARDS

KANNUR UNIVERSITY

B.Sc. (GEOLOGY) DEGREE EXAMINATION: SCHEME OF EXAMINATION AND SYLLABUS

FROM 2007 ADMISSION ONWARDS

Scheme of examination

		duration	marks	internal	total
I YEAR BSc.					
Paper I	Physical Geology and Geomorphology	3 hrs	50	10	60
II YEAR BSc.					
Paper II	Crystallography and Mineralogy	3 hrs	50	10	60
III YEAR BSc.					
Paper III	Stratigraphy and Palaeontology	3 hrs	50	10	60
Paper IV	Structural Geology and Geotectonics	3 hrs	50	10	60
Paper V	Indian Geology and Economic Geology	3 hrs	50	10	60
Paper VI	Petrology	3 hrs	50	10	60
Practical I -	Crystallography ,Mineralogy and Petrology	3 hrs	70	20	90
Practical II -	Palaeontology , Economic Geology and Structural Geology	3 hrs	70	20	90
	Viva Voce		10	10	20
	Laboratory record 1 and 2 (Students are not permitted to appear for Practical Examination without bonafide records)		10	10	20
	Field work, collection of specimens and tour report		20		20
	Total		480	120	600

Field work forms an integral part of the course for all the three years. Only those candidates who submit their practical records will be allowed to appear for the practical examination.Collection of specimens other than during study tour also should be encouraged.

Paper 1 PHYSICAL GEOLOGY AND GEOMORPHOLOGY

Unit I. The Earth- its size, shape , volume and density – views on the age of the earth – origin of the earth – Nebular , Planetesimal, Tidal and Cloud hypotheses.

Unit II. Geospheres-Atmosphere ,Hydrosphere and Lithosphere . External and internal geological processes and agents. The concept of rock cycle.

Unit III. Volcanoes : Machanism and causes of volcanic eruptions, types of volcanic eruptions and products. Global distribution of volcanoes.

Unit IV. Earthquakes : Types and causes .Propagation of seismic waves, focus and epicentre,theory of the origin of earthquakes, siesmograph, scale of intensity and magnitude, causes. Seismicity -Siesmic belts the world.Structural composition of the earth

Unit V. Weathering – Agents, types and products of weathering. Influence of climate and lithology on weathering . Soils – their nature and geological classification. Mass wasting- types , causes and controls.

Unit VI. Streams – Drainage basins and stream systems . Development of a typical river system. River erosion , transportation and deposition. Aggradational and degradational fluvial landforms. Concept of peneplain . Effects of fluctuation of regional base level. Major rivers of India

Unit VII.Oceans and seas: Ocean water – extent and composition, waves, currents and tides. Marine erosion, transportation and deposition. coastal land forms and morphological features of ocean floor. Oceanic sediments. Coral reefs – their origin and distribution.

Unit VIII. Glaciers – formation and morphology, flow of glacial ice, types of glaciers, erosion and transportation by glaciers. Glacial landforms.

Unit IX Lakes – Origin, classification and geological importance. Kayals of Kerala Wind- Cyclones, anticyclones, hurricanes, geological action of wind, Landforms of aeolian origin.A brief study of the major lakes and desert landforms of India

Unit X. Ground water : Source, nature and storage, porosity, permeability, aquifers and aquicludes, water table, seepages and springs, geysers, wells, artesian wells. Geological action of ground water.

Paper 11. CRYSTALLOGRAPHY AND MINERALOGY

A. CRYSTALLOGRAPHY.

Unit I. Elements of crystallography. Crystalline state and crystals.Morphology of crystals, faces, edges, vertex, forms and zones.Crystal angles – plane angles, interfacial angles and solid angles. Goniometer- contact and reflection type. Law of constancy of interfacial angles. External symmetry. Crystal classes Axes – Choice of axes, labelling and orientation Crystal systems- Nomenclature of crystal faces, intercepts, parameters, unit face, Weiss notation, Miller indices Law of rational indices..

Unit II. Systematic crystallography. The study of symmetry, simple forms and combinations of the following crystal classes.
Isometric system - Normal, tetrahedral, pyritohedral, plagiohedral,and tetartohedral.
Tetragonal system – Normal, hemimorphic, tripyramidal, pyramidal hemimorphic, sphenoidal.

Unit III Hexagonal system- (a) Hexagonal division- normal, hemimorphic, tripyramidal, pyramidal hemimorphic, trapezohedral.
(b) Rhombohedral division- rhombohedral, rhombohedral hemimorphic, trirhombohedral, trapezohedral.
Orthorhombic system-normal, hemimorpic, sphenoidal.
Monoclinic system- normal
Triclinic system – normal

Unit1V. Brief study of the following.-Holohedral, hemihedral, tetartohedral, hemimorphic and enantiomorphic forms. Twin crystals- elements of twinning, twin axis, twin plane, composition plane Important examples of twinning.
Brief study of the morphological imperfections of crystals.

B. MINERALOGY

Unit V. Physical mineralogy: Physical properties of minerals like form, habit, cleavage, fracture, colour, luster, streak, hardness, specific gravity. Thermal, electrical and radioactive properties of minerals.
Chemical mineralogy : Geochemical distribution of elements. Types of bonds, ionic radii, ionic ratios, isomorphism, solid solution, exsolution, polymorphism, pseudomorphism, mineraloids, and metamict minerals.

Unit V1 Optical mineralogy : Polarisation of light, polarisation by reflection, absorption, refraction. Double refraction. Construction of nicol prisms.
Petrological microscope- parts and functions, mechanical and optical accessories.
Birefringence, Isotropic and anisotropic substances. Uniaxial and biaxial indicatrices, optic sign.Relief,Pleochroism.

Unit VII. Descriptive mineralogy

a. Classification of minerals

b. Systematic study of the important non silicate minerals- Diamond ,Graphite , Sulphur,Gold , Silver , Copper , Realgar ,Orpiment, Stibnite , Molybdenite, Cinnabar, Sphalerite , Galena , Chalcocite, Bornite , Chalcopyrite, Pyrite, Magnetite, Haematite , Marcasite, Barite , Gypsum, Halite , Flourite , Corundum , Cryolite , Cuprite , Spinel , Chromite , Rutile , Cassiterite , Ilmenite , Monazite ,Psilomelane , Pyrolusite, Goethite , Limonite , Bauxite Calcite , Dolonite , Aragonite , Magnesite ,Siderite , Malachite , Azurite

Unit VIII. Structure and classification of silicate minerals with detailed physical, chemical and optical properties of the following. Olivine family, garnet family, alumino silicate family Epidote family, pyroxene family, amphibole family

Unit 1X. Beryl, cordierite, tourmaline. Clay minerals and mica family. Feldspars, feldspathoids, Quartz and Zeolite group.

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Paper- III STRATIGRAPHY AND PALAEONTOLOGY

A. STRATIGRAPHY

Unit I. Scope and basic principles.- Local section – Type area and Type section strata, Breaks in stratigraphic succession –Unconformities-general nature and types of unconformities -Non-sequences, Diastem ,hiatus and their significance.Overlap and offlap

Unit II. Elements of lithostratigraphic, chronostratigraphic and biostratigraphic classifications and their units. A brief study of the modern trends in stratigraphic classification, stratotypes and type area.

Unit III. Geological time scale and time units. Stratigraphic concepts of correlation, criteria and methods.

B. PALAEONTOLOGY

Unit 1V. Scope and sub-divisions of palaeontology. Fossilisation requisites and methods, Types of fossils and their concept- Index fossils , Body fossils, trace fossils and zone fossils.Transported and leaked fossils. Synthetic fossils and Pseudo fossils.

Unit V Classification and nomenclature of fossils, basic principles of taxonomy and systematics. Binomial nomenclature, type specimens and kinds (Holotype, Genotype, Paratype and Plastotype). Scientific values and uses of fossils.

Unit VI Morphological features, classification and stratigraphic distribution of the following:
Phylum Protozoa -Order: Foraminifera
Phylum Coelenterata-Class :Anthozoa

Unit VII Phylum : Brachiopoda
Sub Phylum Hemichordata- Class :Graptolithina

Unit VIII Phylum Mollusca –Class Pelecypoda, Class Gastropoda,Class Cephalopoda.

Unit IX Phylum Arthropoda –Class Trilobita
Phylum Echinodermata-Class: Crinoidea, Class: Echinoidea

Unit X. A brief study of the following plant fossils of India. Glossopteris, Gangamopteris, Ptilophyllum,Williamsonia, Sigillaria, Calamites, Lepidodendron, Introduction to vertebrate fossils

Paper-IV- STRUCTURAL GEOLOGY AND GEOTECTONICS

Unit I Stratification, dip, strike, apparent dip, outcrop. Factors controlling pattern and width of outcrops. Outlier, Inlier.
Rule of V's, simple problems involving dip, apparent dip , thickness of beds and width of outcrops.
Use of clinometer and Brunton compass.
Rock deformation-stress and strain. Stages of rock deformation Factors controlling rock deformation

Unit II Folds-Geometry and elements of folded surface. Geometric classification of folds. Recognition of folds in field and on maps.

Unit III Faults: Terminology, classification, Mechanics of faulting, criteria for recognition of faults in the field and on maps.

Unit IV Joints: Nature,origin and classifications.Unconformities and their recognition in the field and on maps.

Unit V Foliations and lineations-introduction, mode of occurrence.

Unit VI Topographic methods of representation- contour , topographic maps, geological maps, conventional map and rock symbols. Interpretation of geological maps.

Unit VII Origin of Mountains- structure and classification Theory of orogeny .Mobile Belt Alpine Himalayan Orogeny . Isostasy.

Unit VIII Major structural features of earth-shield, craton, platform, mid ocean ridge system, deep sea trenches, island arcs, fracture systems, geosynclines hot spots, mantle plumes.

Unit IX Outline study of global tectonics.Concepts of global tectonics.Continental Drift Convection Current Hypothesis.Modern tectonic hypothesis- Sea floor spreading,

Unit X Plate tectonics- Evolution of the concept, types of plates and boundaries, triple junctions, mechanism of plate movements. Polar reversals, Palaeomagnetism.

Paper-V- INDIAN GEOLOGY AND ECONOMIC GEOLOGY

A. INDIAN GEOLOGY

Unit I Brief study of the physiographic divisions of India. Major geological divisions of India. Geological time scale and its representative in Indian stratigraphy. General study of Early Precambrian terrains of India and detailed study of the lithology, classification, structure, syn-and post-tectonic intrusives, organic remains, radiometric age and economic resources of the following:
Archaean Formations- Sargur Supergroup, Dharwar Supergroup and associated granites and gneisses. Aravalli Supergroup of Rajasthan.Singhbhum Craton .Sausar Series. Sakoli.

Unit II General study of the Proterozoic formation .Precambrian terrains of India and detailed study of lithology, classification, structure, associated intrusives, organic remains, radiometric age and economic resources of the following:
Delhi Supergroup, Cuddapah Supergroup, Vindhyan Supergroup and Kurnol supergroup..

Unit III A brief study of the distribution of marine Palaeozoic and Mesozoic successions of India and detailed study of the following:
Palaeozoic and Triassic succession of Spiti region. Jurassic of Spiti and Kutch. Cretaceous of Trichinopoly and Narmada Valley.

Unit IV Gondwana Supergroup: Distribution, lithology, classification, age, structural features, fossils and coal resources. Deccan Traps and associated sedimentaries, thier distribution, lithology, classification,fossils and age.

Unit V A brief study of the distribution of Cenozoic rocks of India with detailed study of the following: Cenozoic oil-bearing formations, Siwalik Supergroup, Tertiaries of Tamilnadu . Karewas, Indo-Gangetic Alluvium.

Unit VI. Geology of Kerala – Precambrian and Tertiaries

B. ECONOMIC GEOLOGY

Unit VII Definition and scope of economic geology – Ore and gangue minerals, tenor of ores – syngenetic and epigenetic deposits- Classification of mineral deposits – Bateman's calssification and modern trend in classification.

Unit VIII Magmatic deposits–Hydrothermal deposits .Pegmatite mineral deposits, volcanic exhalative deposits- Contact metasomatic deposits-.

Unit VIII Evaporites, sedimentary deposits, oxidation and supergene sulphide enrichment deposit, mechanical concentration deposits, residual concentration deposits. Metamorphic deposits

Unit IX Mode of occurrence, distribution in India and important economic uses of the following: Ores of aluminium, chromium, copper, gold, iron, lead, zinc, manganese, thorium, uranium and titanium Minerals used as abrasives, refractories, Fertilizers, ceramics and gem stones, coal and petroleum. Mineral deposits of Kerala

PAPER VI- PETROLOGY

A. IGNEOUS ROCKS

Unit I Rocks and their classification. Igneous rocks. Primary and secondary rocks Rock cycle .Magma and its composition . Evolution of magma. Crystallisation of magma. Reaction principle and Bowen's reaction series.

Unit II Crystallisation of the following binary systems:
1.Albite-Anorthite
2.Forsterite-Fayalite
3.Diopside-Anorthite
4.Forsterite – Silica.

Unit III Textures and structures of igneous rocks. Classification and nomenclature of igneous rocks. Forms of igneous rocks .

Unit IV Systematic description and petrogenesis of the following families: granite, syenite, diorite and gabbro.Holomafics.

B.SEDIMENTARY ROCKS

Unit V Origin, transportation and deposition of sediments, stucture and texture of sedimentary rocks.

Unit VI Description , origin and classification of sedimentary rocks . Residual rocks , pyroclastic rocks, detrital rocks , chemical rocks and organic rocks.

Unit VII Brief study of the following: Carbonaceous rocks and laterites.

C.METAMORPHIC ROCKS.

Unit VIII Definition of metamorphism, factors of metamorphism, types of metamorphism. Metasomatism, Prograde and retrograde metamorphism,

Unit IX Nomenclature of metamorphic rocks, zones of metamorphism and index minerals , concept of metamorphic facies and grades.

Unit X Metamorphism of argillaceous , arenaceous ,calcarious and basic rocks. Description of Slate , phyllite , schist , gneiss , amphibolite , marble, granulite. 7

PRACTICALS.

PAPER 1-CRYSTALLOGRAPHY,MINERALOGY AND PETROLOGY.

A. CRYSTALLOGRAPHY

Drawing of typical, simple forms of the various classes of different systems mentioned in the theory part and the most frequently occurring crystal combinations of the following minerals

Galena, garnet, spinel, magnetite, fluorite, sphalerite, tetrahedrite, pyrite, zircon, rutile, vesuvianite, cassiterite, apophyllite, scheelite, wulfenite, chalcopyrite beryl, molybdenite, beta quartz, calcite, tourmaline, alpha quartz, barite, olivine, sulphur, topaz, stibnite, enstatite, gypsum, orthoclase, augite, hornblende, biotite, epidote, axinite, plagioclase, rhodonite, microcline.

Twin crystals- fluorite, magnetite, tetrahedrite, eossiterite, zircon, chalcopyrite calcite, quartz, aragonite, staurolite, augite, gypsum, orthoclase, plagioclase.

B. MINERALOGY

Megascopic study and identification of the following minerals: Native copper, sulphur, graphite, chalcopyrite, bornite, galena, sphalerite, pyrrhotite, cinnabar, chromite, realgar, orpiment, stibnite, pyrite, cobaltite, marcasite, molybdenite, cuprite, zincite and important non-silicate minerals.

Megascopic and Microscopic study of the following minerals:

quartz, orthoclase, microcline, plagioclase, perthite, leucite, nepheline, olivine, enstatite, hypersthene, augite, diopside, tremolite, actinolite, hornblende, anthophyllite, biotite, muscovite, chlorite, cordierite, andalusite, sillimanite, kyanite, staurolite, calcite, sphene, apatite, zircon. Garnet.

Vibration directions of the polarizer and analyser of microscopes.

Use of Michel-Levy chart for the determination of birefringence, thickness of mineral section and interference colours of minerals.

C. PETROLOGY

Megascopic study and identification of the following rocks:

granite, pegmatite, diorite, syenite, gabbro, anorthosite, dunite, peridotite, dolerite, rhyolite, basalt, andesite, pumice, scoria, obsidian, conglomerate, breccia, sandstone, arkose, greywackes, grit, oolitic limestone, fossiliferous limestone, shale, laterite, quartzite, marble, amphibolite, schist, gneiss, granulite, eclogite, charnockite, leptynite, phyllite.

Microscopic study and identification of the following rocks:

1. Granite, diorite, syenite, gabbro, norite, anorthosite, pyroxenite and dunite.
2. Felsite and dolerite.
3. Basalt, rhyolite and andesite.
4. Breccia conglomerate, sandstone, greywacke, arkose, fossiliferous limestone, oolitic limestone and shale.
5. Slate, phyllite, quartzite, schist, gneiss, granulite, khondalite, charnockite, eclogite, amphibolite and marble.

Paper II- PALAEONTOLOGY, ECONOMIC GEOLOGY AND STRUCTURAL GEOLOGY

Palaeontology Sketching the following fossils with description, taxonomic position, strtigraphic range and representation in Indian strata.

Protozoa- Textularia, Globigerina, Lagena, Nummulites, Nodosaria,
Coelenterata- Zaphrentis, Lithostrotion, Calceola, Syringopora, Halysites, Favosites, Holiolites, Montlivaltia, Isastria, The cosmilia.
Brachiopoda- Lingula, Orthis, Terebratula, Pentamerus, Rhynchonella, Productus, Strophomena, Atrypa, Athyris, Spirifer,
Pelecypoda: Nucula, Glycimeris, Arca,Trigonia Unio. Spondylus, Pecten. Inoceramus, Ostraea, Gryphaea, Alectryonia, Exogyra and Hippurites
Gastropods- Bellerophon, Pleurotomaria, Cerithium, Turritella, Conus, Murex, Physa, Trochus, Cypraea
Cephalopoda-Orthoceras, Nautilus, Goniatites, Tropites, Macrocephalites, Persphinctes, Phylloceras, Schloenbachia
Trilobita - Olenellus, Phacops, Calymene, Paradoxides, Olenus, Agnostus,
Echinoderms-Crinoidea-Apiocrinus, Pentacrinus, Encrinus
Echinoidea, Cidaris, Hemicidaris, Holaster, Micraster
Hemichordata-Monograptus, Didymograptus, Phyllograptus, Rastrites,Tetragraptus
Plant fossils- Lepidodendron, Sigillaria, Calamites, Glossopteris, Gangamopteris, Ptilophyllum, Taeniopteris, Williamsonia

B- Economic Geology- Identification of important ores and economic minerals

C- Structural Geology- Interpretation of simple geological maps and preparation of sections. Simple problems in structural geology.

D- Fieldwork and collection of specimens: study of geological formations, collection of rocks, minerals and fossils and field trips to places of geological importance in India will form an integral part of the course for all the three years.

BOOKS FOR STUDY AND REFERENCE

Paper I Physical Geology and Geomorphology

BLOOM A.L. (1992): Geomorphology, Second Edition, Prentice Hall India Pvt.Ltd., New Delhi.
HOLMES A.(1981): Principles of Physical Geology. ELBS, Third Edition.
GILLULY,J.,WATERS A.C. and WOODFORD A.C.(1975) Principles of Geology, Fourth Edition, W.H. Freeman and Co., 9
JUDSON S. and KAUFFMAN M.E.(1990)Physical Geology Eighth Edition, Prentie Hall, New Jersey.
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SAWKINS,J.S.,CHASE,C.G., DARBY,D.G. and RAPP,G.(1978).The evolving earth, Mac Millan Publishing Co., New York.
SPENCER, Structure of the Earth. Wiley.
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