

Geology - 2020-21

**THE M.Phil / Ph.D ENTRANCE TEST SYLLABUS**

**[As per M.Phil. Ordinance no.13 and Ph.D. Ordinance no.11]**

The Test will have the question paper in **two parts A and B.**

The Syllabus for **Part A: Research Methodology** [Common to all subjects of faculty of Science (i.e. 1. Physics 2. Mathematics 3. Statistics 4. Chemistry 5. Geology 6. Pharmacy)]. 50x1=50

**Part-A** shall consist of **50 objective type** compulsory questions of 1 mark each based on **Research Methodology**. It shall be of generic nature, intended to assess the research aptitude of the candidate. It will primarily be designed to test reasoning ability, data interpretation and quantitative aptitude of the candidate.

H.S. Singh  
23/7/18

Datta

S. K. Singh

Sanjay K. G. N.

~~Patel~~  
Purohit

~~A~~  
B

Omni  
K. R. B.

# THE M.Phil./Ph.D. ENTRANCE TEST SYLLABUS

## Syllabus for Part-A: Research Methodology 50×1=50

[Common to all subjects of faculty of Science (i.e.1. Physics 2. Mathematics 3. Statistics 4. Chemistry 5. Geology 6. Pharmacy)].

- Meaning of research, Objective of research, Types of research, Research approaches, Significance of research, Research methods versus research methodology, Research process, Criteria of good research.
- Research Problem, Selecting the problem, Necessity of defining the problem, Technique involved in defining problem.
- Meaning of Research Design, Need for Research Design, Feature of good Design, Important Concepts Relating to Research Design: Dependent and Independent variables, Extraneous Variable, Control, Confounded Relationship, Research Hypothesis, Experimental and Non-Experimental Hypothesis, Experimental and Control Groups, Treatments, Experiment, Experimental unit (s), Research Designs in Case of Exploratory Research Studies, Descriptive and Diagnostic Research Studies.
- Quantitative and Qualitative data, Classification of Measurement Scales: Nominal Scale, Ordinal Scale, Interval Scale, Ratio Scale. Goodness of Measurement Scale: Validity, Reliability and Practicality.
- Types of data: Primary and Secondary, Methods of Collecting Primary data: Observation method, Interview method, Collection of data through questionnaires, Collection of data through schedules, Difference between questionnaires and schedule, Collection of secondary data.
- Classification of data, Tabulation, Diagrammatic and Graphical representation of data: Bar chart, Pie chart, Box plot, Histogram, Frequency polygon, Frequency Curve, Ogive.

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- Measure of Central Tendencies: Mean, Median, Mode .

Measures of Variability: Range, Quartile Deviation, Standard Deviation and Coefficient of variation.

- Meaning of Correlation, Scatter diagram, Karl Pearson Coefficient of Correlation, Rank Correlation, Regression lines, Regression coefficients, Properties of regression coefficient. Normal Distribution and its Properties
- Testing of Hypothesis and Test of significance: Null and Alternative Hypothesis, Type I and Type II errors, Critical region, Level of significance, One-Tailed and Two- Tailed Tests, Large sample tests: Test of significance for single proportion, Difference of proportions, Single mean and difference of means, Chi -Square test of goodness of fit and independence of attributes. Small sample tests: t-test for single mean, t-test for difference between two sample means, Paired t-test for difference of means, F-test for equality of population variances.
- Analysis of Variance.
- Computer languages and Operating System(OS)-Assembly language, Machine language, MS-DOS and Windows.
- MS-Word and Power point presentation.

*Handwritten signatures and initials:*  
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Sahib  
Sanjay K. G  
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# Syllabus For M. Phil / P.D. Entrance (DET) Test - onward

## 1. GEO-TECTONIC AND GEOMORPHOLOGY

### Geo-Tectonic

Intensity and isoseismic lines, earthquake belts, Seismograph, Palaeomagnetism and its application for determining palaeoposition of continents. Classification and evolution of Geosyncline, causes of subsidence and upliftment. Principles of Geodesy. Evidences of continental drift and polar wandering. Sea floor spreading, topography of mid-ocean ridges, Morphological features of ocean floor. Palaeoposition of India and Geodynamics of the Indian plate. Causes of Plate Motion. Origin of the Himalayas. Seismic belts of the earth. Evidences of continental drift and polar wandering.

### Geomorphology

Ancient Landscapes, Geomorphic Materials And Processes Structure: Large-Scale Tectonic And Structural Landforms, Small-Scale Tectonic And Structural Landforms, Glacial And Glaciofluvial Landscapes, Rock-breaking by Organic Agencies, Corrasion and Transportation by Running Water, Gravity Transportation or Mass Movements, The Geomorphic Cycle, Graded Reaches, Maturity of Rivers, Capture, or "River Piracy," Subsequent Erosion on Folded Rocks, The Drainage of Mountainous Areas of Folded Rocks, Structural Benches and Terraces, Widening of Valley Floors, Narrowed and Cut-off Spurs, Valley Plains and Meanders, Accelerated Soil Erosion, Soil-depleting Processes, Rock Solubility: Erosion by Underground Water, Travertine Falls and Dams, The Karst or Limestone Cycle, Peneplains and Monadnocks, Distributed Faults and Fault Splinters,

## 2. PETROLOGY

**IGNEOUS AND METAMORPHIC PETROLOGY:** Evolution of magma by Differentiation and Assimilation. Phase Equilibria of Monary (Silica), Binary (Mixed and Eutectic) and Tertiary (Ab - An - Fa - Silica) Silicate Systems. Textures and structures of igneous rocks and interpretation of crystallisation history. Classification of igneous rocks including IUGS system. Magmatic and Granitisation Process. Petrogenesis. Agents of metamorphism. Metamorphic grades, facies and facies series. Textures and structures of metamorphic rocks Facies classification. Metasomatism and their types. Metamorphism of carbonates, Pelites, Alkaline and Ultra Mafic rocks.

**SEDIMENTOLOGY:** Process of sedimentation, Classification and Nomenclature of the Common Sediments, Stoke's Law of Sediments. Sedimentary Structures. Paleocurrent Significance in Quality Assessment. Textures of Sedimentary Rocks and Their Genetic Significance. Granulometric Analysis of Clastic Particles, Sedimentary Environments, Evaporites and Volcano- Clastic Sediments. Concept and Types of Sedimentary Provenance. Heavy minerals: Their separation and Utility in the Provenance Analysis. Classification of Sandstone.

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### 3. FUEL GEOLOGY

**COAL-~~MINE~~:** Origin of Coal. Elementary idea about Coal Mining Methods. Coal Bed Methane. Methods of Coal Prospecting. Preparation of Coal for Industrial Purpose (Washing), Carbonization (Coke Manufacturing), Gasification and Hydrogenation, Briquetting of Coal. Analysis Rank and Varieties of coal. Macroscopic Ingredients and Microscopic Constituents (Lithotypes, Maceral, and Microlithotypes).

**PETROLEUM:** Origin and Geology of the Productive Oil Fields of India. Migration and Accumulation (oil-traps) of Petroleum and Natural Gas. Source rock and hydrocarbon generation, Major types of hydrocarbon of Interest to petroleum Exploration. Basic geological condition that create petroleum Traps, Reservoir Fluid Mechanics.

### 4. MINERAL EXPLORATION

Methods of geological exploration: exploratory grids pits, trenches, well logging in evaluation of deposits. Sampling types and methods. Assaying by channel sampling and placer sampling underground mining sampling. Classification and principles of geophysical methods. Seismic methods; Elastic properties of rocks, types of elastic waves (P, S, L waves), Refraction and reflection methods. Sampling technique for geochemical exploration. Path finder elements, Mode of occurrence of trace elements, Primary dispersion patterns. Calculation of ore reserves.

### 5. ECONOMIC GEOLOGY

Control of ore deposits. Paragenesis and zoning in mineral deposits. Magmatic concentration, Contact Metasomatism, Hydrothermal and Volcano-genetic deposits. Magmatic concentration, Contact Metasomatism, Hydrothermal and Volcano-genetic deposits. Textures and Structures of Ores, Uses and Indian occurrences of the ores of Iron, Manganese, Chromium, Nickel, Copper, Lead, Zinc, Aluminum, Tin, Tungsten and Gold. Specification and grades for uses in Industries and Indian occurrences of the non-metallic minerals – Mica, Asbestos, Barite, Graphite, Gypsum. Minerals used in Fertilizers and Cement Industries.

### 6. ENGINEERING GEOLOGY

Importance of geology in civil engineering Projects. Engineering properties of rocks. Geological Considerations for Tunneling in different Grounds. Geological considerations for construction of highways. Geological considerations for the selection of a dam site and reservoir. Bridge, Canals, Landslide. Consideration of civil engineering in seismic areas. mitigation and management. Merits and demerits of civil engineering in folds, faults and joints affected area.

## 7. STRUCTURAL GEOLOGY

Rock failure: Mechanical principles of rock deformation, factors controlling behavior of material. Concept of stress and strain in two and three dimension, progressive deformation. Mohr circles. Symmetry concept in deformation. Unconformities. Progressive deformation – simple and pure shear. Geometry of folds surface. Super – imposed folding. Classification and Types of folds. Geometry of faults. Classification and types of faults. Slips, separation, Causes of faulting. Mechanics of faulting. Origin, kind and their relation to other structures: fractures and joints, lineation, Foliation, Rock cleavages and schistosity. Mechanics of folding and faulting. Tectonic Fabrics. Magma Tectonics: emplacement of plutons, origin of Ring Dykes and Cone Sheets.

## 8. MINERALOGY & GEOCHEMISTRY

Classification of Silicate structure. n. Atomic structure & mineralogical properties of the following: Sulfides ( $AX$ ,  $A_2X$  &  $AX_2$ ), Oxides ( $XO$ ,  $X_2O$ ,  $XO_2$  &  $X_2O_3$ ) types; Sulfates (Hydrous & anhydrous); Carbonates (Calcite, aragonite & dolomite). Atomic structure, physical - optical properties & paragenesis of olivine, garnet, pyroxene, amphibole, mica, epidote & chlorite group minerals. Atomic structure, chemistry, physical & optical properties of feldspar, feldspathoid, quartz, zeolite & aluminum silicate group minerals. Precious & semiprecious stones occurrences & distributions. Principles of optics, double refraction, optical classification of minerals, determination of refractive index. Concept of geochemistry & geochemical cycle, geochemical classification of elements, composition of Earth.

## 9. STRATIGRAPHY

Criteria for the Stratigraphic classification and correlation. Litho-, Bio- and Chrono- stratigraphic units. Magneto-stratigraphy. Sequence Stratigraphy. Geological time-Scale. Orogenic cycles in the Indian Stratigraphy. Geological column of Indian Stratigraphy. Ice-ages in the Indian Stratigraphy. Archaean (Azoic) History of India. Precambrian (Proterozoic) History of India: Distribution and stratigraphy of the Cuddapah and Vindhyan Super Groups. Palaeozoic history. Origin and age of Saline Formation. Precambrian – Cambrian Boundary problem. Mesozoic history. Bagh beds. Lameta beds. Deccan Traps. Permo- Triassic Boundary problem. Palaeoclimate, classification, distribution and stratigraphy of the Gondwana Super Group. Tertiary of Assam, its economic importance. Siwaliks and its vertebrate fossil record. K-T Boundary.

## 10. PALAEOBIOLOGY

Modes of fossilization, uses of fossils, Classification, evolution, geological history of: Trilobites, Graptolites, Echinoids and Corals. Classification, evolution, geological history of the following: Brachiopoda, Gastropoda, Lamellibranchia and Cephalopoda. Succession of the Vertebrate Life

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through the geologic time. Evolutionary history of Human, Elephant and Horse. Micropaleontology : Classification, separation of microfossils. Applications of microfossils in fossil fuel exploration, Morphology and geological history of foraminifera. Concept of Palaeobotany and Palynology. Plant life through ages. Characteristic features of Lower Gondwana flora. Characteristic features of Upper Gondwana flora.

## 11. HYDROGEOLOGY

Distribution of water. Hydrological cycle, Evaporation, Condensation, Precipitation and its types. Ground water: Origin, importance, occurrences. Groundwater provinces of India. Geological factors governing the occurrence of ground water. Porosity, permeability, specific yield, specific retention, hydraulic conductivity, storage coefficient, aquifers and their classification. Groundwater flows. Darcy's Law. Water level fluctuation. Elementary idea about pumping test. Ground water quality: Physical and Chemical characteristics. Biological characteristics. Water contaminants and pollutants. Radioisotopes in Hydrogeological Studies. Geophysical methods of groundwater exploration, Salt water intrusion in coastal aquifers,. Water harvesting & artificial recharge methods, elementary idea about groundwater development & conservation.

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