Maharshi Dayanand University
Rohtak

Ordinances, Syllabus and Courses of Reading for
M.Sc. (Prev.) Geology
Examination

Session—2002-2003

ıblication)
'Jniversity
ana)

Price :
At the Counter : Rs. 50/-
By Regd. Parcel : Rs. 75/-
By Ordinary Post : Rs. 60/-

ORDINANCE - 'MASTER OF SCIENCE EXAMINATION'

1. The Master of Science Examination shall be held in two parts. Part-I examination shall be held at the end of the first year and Part-II Examination at the end of the second year.
2. The Examination in Part-I and Part-II shall be held once a year ordinarily in the month of April on such dates as may be fixed by the Vice-Chancellor.
   A supplementary examination in Part-II of M.Sc. will be held in December for those candidates who have passed all the papers of part-I examination but have got 'reappear' or have failed or want to improve their score in paper(s) of part-II examination. However, total number of chances will not exceed as given in the Ordinance.
3. The last date for the receipt of admission from and fee without late fee as fixed by the Vice-Chancellor shall be notified to the Heads of the University Teaching Deaprtments and the Colleges concerned.
4. A candidate's admission form and fee may be accepted after the last date on payment of late fee as prescribed from time to time up to the date notified by the University.
   No late fee shall be charged if the admission form and fee are received within three working days of grace after the last date for the receipt of the same without late fee.
5. No one shall be eligible to join the first year (Part-I) class of M.Sc. Course unless he has passed one of the following examination:-
   a) B.Sc. (Hons.) examination of this University with atleast 45% marks in the aggregate in the subject offered for the M.Sc. Course.
   b) B.Sc. (Pass) examination with alteast 50% marks in the aggregate.
   c) An examination of any other university recognised by the University as equivalent to (a) or (b) above.

   Provided that :
   i) to be eligible to join M.Sc. Course in Physics, a candidate must have passed B.Sc. Examination with Physics and Mathematics as two of the main subjects:

ii) to be eligible to join M.Sc. Chemistry, a candidates must have passed B.Sc. Examination with Chemistry as one of the main subject.

Note : A Minimum of 25% of the total seats shall be filled in by the students who have passed the B.Sc. Examination with Chemistry, Physics and Mathematics. Any seat remaining unfilled out of this quota may be offered to other eligible candidates

iii) The eligibility condition for admission to M.Sc. courses shall be as follows :

Bio-Chemistry and Bio-Technology:

B.Sc. (Hons.) exam. of this university in the subject offered for the M.Sc. course or an examination of another University recognised as equivalent thereto with atleast 45% marks in the aggregate.

OR

B.Sc. (Pass) examination of this University or an examination of another University recognised as equivalent thereto with atleast 50% marks in the aggregate provided that a cnadidate must have passed B.Sc. examination with any three of the subjects Botany, Zoology, Chemistry, Microbiology, Genetics, Environmental Science, Medical Bio-Chemistry, Bio-Technology, Bio-Chemistry, Bio-Chemical Engineering, Fermentation Technology, Food Processing, Medical Laboratory Technology, Industrial Chemistry, Applied Haemotology and Industrial Microbiology.

Note :

Out of the three subjects atleast one should be related to Biology.

OR

Bachelor degree with 50% marks in Pharmacy/Home Science/Agriculture/Veternary Science from a recognised University.

M.Sc. (Previous) in Botany, Environmental Sciences, Genetics and Zoology.

a) B.Sc. (Hons.) examination of this university in the subject offered for the M.Sc. course or an examination of another University recognised as equivalent thereto with atleast 45% marks in the aggregate.

OR

b) B.Sc. (Pass) examination of this University or an examination of another University recognised as equivalent thereto with atleast 50% marks in the aggregate provided that :

i) to be eligible to join M.Sc. Botany, a candidate must have passed B.Sc. examination with Botany and any two of the subjects viz. Zoology, Chemistry, Microbiology, Environmental Science, Bio-Chemistry, Bio-Technology, Anthropology, Fisheries and Genetics.

ii) to be eligible to join M.Sc. Environmental Science a candidate must have passed B.Sc. examination with any three of the subjects viz. Botany, Zoology, Chemistry, Microbiology, Environmental Science, Bio-Chemistry, Bio-Technology, Anthropology, Fisheries and Genetics.

iii) to be eligible to join M.Sc. Genetics a candidate must have passed B.Sc. examination with any three of the subjects viz. Botony, Zoology, Chemistry, Microbiology, Environmental Science, Bio-Chemistry, Bio-Technology, Anthropology, Fisheries, Geology and Genetics.

iv) to be eligible to join M.Sc. Zoology, a candidate must have passed B.Sc. examination with Zoology and any two of the subjects viz. Botany, Chemistry, Microbiology, Environmental Science, Bio-Chemistry, Bio-Technology, Anthropology, Fisheries and Genetics.

iv) conditions for admission to M.Sc. Course in Mathematics shall be same as prescribed for admission viz. M.A. Course in this subject.

v) To be eligible to join M.Sc. Course in Geology, a candidate must have passed B.Sc. Examination wtih atleast 50% marks in the aggregate with Geology and any of two of the subjects viz. Physics, Mathematics, Chemistry, Botany, Zoology, Bio-Science and Geography;

vi) to be eligible to join M.Sc. Course in

Mathematical Statistics and Operations Research a candidate must have passed B.A./B.Sc. (Pass) Examination with atleast 50% marks in the aggregate with Mathematics or Statistics as one of the subjects or have passed B.A./B.Sc. (Hons.) Examination in Mathematics or Statistics with atleast 45% marks in Mathematics/Statistics.

There shall be a Project Report in M.Sc. Mathematical Statistics (Final) and that the project report shall be evaluated by the external examiner on five point grading. The last date for submission of Project Report will be two months after the theory papers which can be extended further by two months with the permission of the Vice-Chancellor.

Note : A candidate who is placed under compartment in the qualifying Examination shall not be allowed to join M.Sc. Course. He/She will be eligible only after clearing the qualifying Examination.

6.1 A candidate who has failed in one or more papers or fails to appear in the examination shall be allowed two additional subsequent chances only to pass the examination.

6.2 A candidate who fails to pass the M.Sc. examination within a period of four years of his admission to the course shall be deemed to be unfit for postgraduate studies in the subject concerned.

6.3 A person who has passed the M.Sc. (Previous) examination in the subject concerned from this University shall be eligible to join the M.Sc. final class. This is subject to Clause-6.2 above. However, the candidate who have passed atleast two theory papers out of four or five theory papers or atleast three theory papers out of six or seven theory papers of part-I examination of this University will be promoted to Part-II Class provisionally.

7. M.Sc. Examination in Part-I/Part-II shall be open to a student who :-

a) has passed the requisite qualifying Examination or is covered under Clause-6 and

b) has his name submitted to the Controller of Examinations by the Head of the University Department/Principal of the College. He has

most recently attended and produces the following certificates signed by him:-

i) of possessing good character.

ii) of having remained on the rolls of the Department/College, during the year preceding the Examination.

iii) of having attended not less than 65% of full course of lectures and tutorial separately and 75% of practicals in each part (the course to be counted upto the last day when the classes break up for the preparatory holidays).

8. A candidate whether a regular student or an ex-student shall submit his admission application to the Registrar/Controller of Examination duly signed by the Principal of the College/Head of the University Department he has last attended.

9. Every candidate shall be examined according to the Scheme of examination and syllabus as approved by the Academic Council from time to time.

10. The amount of Examination fee to be paid by a candidate for each part shall be as prescribed from time to time.

Note : A candidate who re-appears in one or more theory or practical papers for the purpose of passing the examination or a candidate who appears in one or more theory papers for the purpose of improvement of score of marks/result shall pay fee as for the whole examination.

11. The medium of instructions and examination shall be English.

12.1 The minimum number of marks required to pass the examination shall be as under:-

i) 33% in each paper (written and practical) separately;

ii) 40% in dissertation/viva-voce where prescribed;

ii) 40% in aggregate.

12.2 A candidate who has completed the prescribed course of instructions in a college/University Teaching Department for Previous/Final examination but has not appeared in it or have appeared fails may be allowed on the recommendation of the Principal of the College/ Head of University Teaching Department concerned to appear in the subsequent years in the

examination paper(s) as the cases may be without attending a fresh course of instructions while re-appearing in the examination, the candidates shall be exempted from re-appearing in the paper(s) and/or practical(s) in which he has obtained atleast 40% marks.

13. As soon as possible, after the termination of the examination the Registrar/Controller of Examinations shall publish the result of the Candidates and issue Detailed Marks Card.

14. The result of candidates who have passed M.Sc. examination shall be classified into divisions, as under and the division ontained by the candidate will be stated in this degree.

a) Those who obtain 60% or more marks — First Division
b) Those who obtain 50% or more but less than 60% marks — Second Division
c) All below 50% — Third Division.

15.1 A candidate who has passed M.Sc. Previous examination with atleast 55% marks may offer dissertation wherever prescribed in the Scheme of Examination for the course. The subject of dissertation shall to approved by the Head of Department concerned. A candidate sahll submit to the Head of the University Department an application for the approval of the topic for the dissertation alongwith a synopsis within one month of his admission to M.Sc. (Final) examination.
Provided in the case of M.Sc, (Geology) exam. there shall be a dissertation based on days field work (surface maping) in the M.Sc. Previous. The work of dissertation will be done in the M.Sc. previous and viva-voce examination of dissertation will be held at the end of M.Sc. previous alongwith practical examination. Provided further that the condition of obtaining 55% marks in M.Sc. previous examination, for offering dissertation in M.Sc. final shall not be applicable in the case of students of M.Sc. (Geology) course.

15.2 Every candidate who offers dissertation shall be required to submit three copies of his dissertation alongwith a brief abstract of the same giving an

account of the Investigation research conducted and its main finding (which will not exceed 500 words). The dissertation shall be examined by one external examiner only.

15.3 The last date for receipt of the dissertation in the office of the Controller of Examinations shall be one month before the commencement of the theory examination : Provided that in exceptional cases; the Vice-Chancellor shall have the power to extend, on the recommendation of the Head of the Department the last date for receipt of the dissertation upto three months. If a candidate fails to submit the dissertation even during the extended period he will be considered to have absented in the dissertation paper and his result shall be declared accordingly.

15.4 A candidate who has submitted a dissertation as part of his examination may withdraw the same before it has been examined but once it is examined and the candidate obtains the minimum pass marks he shall not be permitted to withdraw it or submit another dissertation in lieu thereof. The marks obtained by him for the dissertation shall be taken into account when he appears in any future examination for the purpose of passing therin or for improving score of marks/result.

16. A candidate who has already passed the Master of Science examination from this University, in a subject in which different optional papers are permitted, may appear in one or more optional paper(s) of that subject at an subsequent examination when held as a regular student only. The examination fee shall be as prescribed from time to time.

Such a candidate shall in order to pass, be required to obtain atleast 40% marks in each paper in theroy and practical spearately.

17.1 A person who has passed the M.Sc. previous examinations of this University will be allowed to appear as an ex-student in the M.Sc. previous examinations for improvement alongwith M.Sc. final examinations respectively, only once, in one or more theory paper(s) within a period of 3 years of passing M.Sc. previous examination.

A person who has passed the M.Sc. examination of this University, and desirous of improving his score of marks will be allowed to appear as an ex-student in the M.Sc. final examinations, for improvement only once in one or more theory paper(s) within a period of two years of his passing the M.Sc. examination. In all a candidate will be allowed to avail one chance within the period specified above. Improvement in practical paper is not permissible.

The result of such a candidate shall be declared only if he improves his score of marks, by taking into account the marks obtained by him in the paper(s) in which he re-appeared and the marks obtained by him earlier in the remaining paper(s). The fact that the candidate has improved the division shall be mentioned in the Detail Marks Cards. If a candidate opts to appear in both previous and final examinations for the purpose of improvement but finds that he has improved the score of marks obtained by him in the previous examination, he may not appear in the final examination as the case may be and inform the Controller of Examinations for the declaration of his result.

Provided further that the candidate will take the examination according to the syllabus in force for the regular students for that examination. Provided that the syllabus for the candidates for the special examination to be held in September/October shall be the same as was in force for the regular student in the last annual examination.

18. Notwithstanding the integrated nature of this course which is spread over more than one academic year, the Ordinance in force at the time a student joins the course shall held good only for the exmination held during or at the end of the academic year and nothing in this ordinance shall be deemed to debar the University from amending the Ordinance and the amended Ordinance, if any, shall apply to all students whether old or new.

19. candidate admitted to M.Sc. Course in 1990-91 or earlier shall be governed by the old rules. The new rules shall be applicable w.e.f. the admission of academic Session 1991-92.

M.Sc. (Previous) Geology

Optimum contact Hours and Scheme of Examination for M.Sc. (Geology) Two years Course M.Sc.(P) Geology

Note : The examination will consist of four theory papers, each of three hours duration, and three practical examination, each of three hours duration and the examination of Dissertation (Geological) field report with Viva-voce.

Note : The candidate will have to study the following compulsory papers.

		Max. Marks	Teaching Hrs. Per week
Paper-I	Geomorphology & Remote sensing	80	4 and half
Paper-II	Structural Geology and Tectonics	80	-do-
Paper-III	Crystallography & Mineralogy	80	-do-
Paper-IV	Igeneous & Metamorphic Petrology	80	-do-
Paper-V	Structural Geology Practical	50	-do-
Paper-VI	Crystallography & Mineralogy Practical	50	-do-
Paper-VII	Petrology Practical	50	-do-
Paper-VIII	Dissertation	30	-do-
	Total	500	36

Note : Dissertation (Field Work)

(i) Each student shall be required to go for a field work to a suitable area for geological mapping for two weeks in type geological, area under the supervision of the teachers of the department.

Paper-I Geomorphology & Remote Sensing

Facts and Figures regarding the shape & size of the earth. Origin of Earth-A general review of all the theories.

Age of the Earth : Modern methods based on disintegration of Uranium, Thorium Rubidium, Strontium Potassium and Radiocarbon.

Interior of the Earth : Sources of knowledge, artificial sources, evidences from the theories of origin of earth, natural sources. seismology, density and temperature, Composition and structure of mantle and core.

Isostasy : Definition, development of idea through Pratt, Airy, Arthur Holmes, Joly, Hayford and Bowie.

Plate Tectonics : Meaning and concept, Plate margin, Plate boundary, Sea floor spreading, plate motion, causes of plate motion, Plate tectonics and Continental drift, Plate tectonics and mountain building.

Mountain building : Orogeny, orogenic cycle, various theories of mountain building.

Continental Drift : Recent views regarding continental drift.

Land Slides : Types, causes and effects of slide, Rock fall, Rock slide, Creep, earthflow and subsidence.

Wind : its geological action, erosional, transportational and depositional features. Applied aspects such as engineering problems in loesess and sand dune areas.

Glacier : Types & movement of glaciers. Erosion, transportation, deposition and resulting geomorphology.

River : Erosion, transportation and deposition, development of river system, drainage pattern, meandering, rejuvenation and piracy in rivers. Applied aspects such as engineering significance of alluvial deposits.

Applied Geomorphology : meaning & concept, applied geomorphology in Indian context : geomorphology & regional planning : geomorphology & hazard management, geomorphology & Urbanisation, geomorphology & engineering works, geomorphology & hydrology, geomorphology & mineral exploitation.

Remote Sensing

Principles of remote sensing : general idea about aerial photographs and their geometry. Application of remote sensing in geology.

Geological Studies : Image characters and their relations with ground objects based on tone, texture and pattern, Principles of terrain analysis, evaluation of groundwater potential, rock type identification and interpretation of topographic and tectonic features.

Books Recommended

1. Principles of Geomorphology by W.D. Thornburry John Wiley.
2. Principles of Physical Geology by Arthur Holmes, Nelson 1969.

3. Morphology of Earth by Lester King.
4. Gupta R.P., 1990 Remote Sensing Geology, Springer Veriag.
5. Pandey, S.N., 1987 : Principles and applications of Photogeology Wiley Eastern, New Delhi.
6. Lillesand, T.M. and Kieffa, R.W. Remote Sensing and image interpretation. K.John Wiley.
7. Sabbins, F.F. 1985 : Remote sensing - Principles and Applications. Freeman.
8. Miller, V.C. 1961 : Photogeology, Mc Graw Hill
9. Praine, D.P. 1981 : Aerial Photography and image interpretation for Resource Management John Wiley.

Paper II Structural Geology & Tectonics

Mechanical Principles and properties of rocks and their controlling factors. Theory of rock failure. Kinds of deformation. concept of Stress and Strain.

Strain and Stress analysis. Three stages of deformation, stress-strain diagrams, Hoock's Law, factors controlling the behaviour of material, confining pressure, temperature, time and solution. Anisotrophy and'inhomageneity. Mechanics of plastic deformation.

Fold : description, parts nomenclature, classification, field study, analysis of folding, development of folding, relation of folding to pressure, Mechanics of folding.

Fracture and Joints : Nomenclature, classification origin & significance.

Fault : Geomatric and genetic classification, recognition of faults in field, mechanism of fauling, strike slip fault, normal fault, over-thrust and Nappe.

Planner and Linear Fabrics in deformed rocks i.e. foliation and lineation, types their origin and significance.

Unconformity : Kinds, recognition of unconformaties in out-crop, distinguishing faults and unconformities in the field.

Top and bottom criteria of the beds : significance of various sedimentary structures, features of lgneous rocks. significance of palaeontology.

Concept of Petrofabric and symmetry : Objective, field and

Laboratory and interpretation on microscopic and mesoscopic scale. Symmetry of fabric and symmetry of movements, their correlation, Significance of π (pai) and β (beta) diagrams.

Plate Tectonics : Recent advances, Dynamic evolution of continental and oceanic crust, Ridges, Trenches and transform faults, Formation of Mountain roots. Plate tectonics and mountain belts : Structure and origin of Alpine-Himalyan belt, the appalachian - Calidonian Belt, The Andies, the North American cordillera.

Books Recommended

1. Badgley, P.C. 1965 :, Structure and Tectonics. Harper and Row.
2. Ramsay, J.G. 1967 : Folding and Fracturing of Rocks, Mcgraw Hill.
3. Hobbs, B.E. Means, W.D. William, P.F., 1976 : An outline of structural Geology, John Wiley.
4. Ghosh S.K. 1995 : Structural Geology Fundamentals of Modern Developments. Pergamoh Press.
5. Moopres, E and Twiss, R.J., 1995 : Tectonics. Freeman.
6. Validiya, K.S., 1998 : Dynamic Himalayan. University Press Hyderabad.
7. Summerfield, M.A., 2000 : Geomorphology and Global Tectonics. Springer Verlag.
8. Turner, F.J. and Weiss, L.E. : Structural Analysis of Metamorphic Tectonites.
9. Billings, M.P. Structural Geology.

Paper III Crystallography & Mineralogy

Crystal elements, crystal symmetry, Laws of crystallography, the common holohedral, hemihedral and hemimorphic forms in crystallography, stereographic projection.

Twinning : The laws of twinning, composition plane, twin plane, twin axis, various examples of twin in crystals.

Study of symmetry character with examples of the following classes : Cubic : Normal, tripyramidal, hemimorphic, sphenoidal and trapezohedral.

Hexagonal : Normal, tripyramidal, Pyramidal, Hemimorphic, trapezohedral rhombohedral, hemimorphic trihemobohedral.

Orthohombic : Normal, Hemimorphic, sphenoidal.

Monoclinic : Normal

Triclinic : Normal

Mineralogy

Structure of silicates and its bearing on the classification of various rock forming silicates.

Detailed study of important rock forming mineral groups: Silica, garnet, pyroxene, amphibole, mica, feldspar, felspathoid, calcite & scapolite groups their physical, optical characters, chemical characters, mode of occurrence, origin, association and alteration.

Systematic mineralogy of metallic ores : Iron, Manganese, copper, Lead, Zinc, Alluminium, Tin, Gold Silver, Chromium, Antimony, Arsenic, Titanium, Uranium, Molybednum and Mercury.

Sampling and sample preparation, thin section & polished section making, sample etching, elementary ideas about atomic absorption spectrophotometry and electronprobe microanalysis. Optical properties of minerals, optical classification of mineral into isotropic and anisotropic minerals, Nicol Prism and Polaroid plate, birefringence and uniaxial and biaxial crystals and its determination, construction and use of accessories such as quartz wedge, gypsum plate and mica plate. Determination of optic sign. Extinction, its types, extinction angle and its determination.

Optical axial angle and its determination.

Books Recommended

1. Dana E.S. and Ford W.E. : A text book of Mineralogy.
2. H.H. Read : Rutle's elements of Mineralogy.
3. Winchall, A.N. Elements of optical Mineralogy.
4. Wahlstrom, E.E. Optical crystallography.
5. Dear, W.A. Howie, R.A. and Zussman, J. 1996 : The rock forming Minerals, Longman.
6. Phillips, Wm R and Griffen, D.T., 1986 Optical mineralogy, CBS Edition
7. Paul F. Kerr, Optical Mineralogy.

Paper IV Igneous and Metamorphic Petrology

Igneous Petrology : Physics of magma generation in the Mantle, their nature. Factors affecting magma and evolution of magma. Study of important single, binary and ternary silicates systems. Magmatic differentiation and assimilation, Role of Water in the crystalisation of basaltic magma.

Criteria for classification of Igneous rock, Norms - CIPW and Niggli Value. Textures and structures of igneous rocks. Rock suite, series : Petrographic province and association.

Petrogenesis of major Igneous types such as ultra mafic/ komatite, basaltic, granitic and alkaline rocks.Geochemical and trace elements, their abundance and classification, Geochemical prospecting.

Matamorphic Petrology

Mineralogical phase rule of closed and open system. Kinds of Matmorphism, texture of metamorphic rocks, metamorphic minerals and Idioblasitic series. Facies concept, facies of contact and regional metamorphism.

Matasomatism, Metamorphic differentiation, Anatexis and Palingenesis. Origin of Migmatite and Khondalite.

Occanic floor metamorphism. Nature of metamorphic reactions and pressure-temperature conditions of metamorphism.

Books Recommended

1. Turner, F.J. 1980 : Metamorphic Petrology, Mc Graw Hill, New York.
2. Yardley, B.W. 1989 : An Introduction to Metamorphic Petrology, Longman New York.
3. Bucher, K. and Frey, M. 1994 : Petrogenesis of Metamorphic Rocks. Springer, Verlag.
4. Philipotts, A, 1992 : Igneous and Metamorphic Petrology, Prentice Hall.
5. Best, M.G., 1986 : Igneous Petrology, CBS Publ.
6. McBirney, A.R. 1993 Igneous Petrology, Jones & Barllet Publ.
7. Kretz, R. 1994 : Metamorphic Crystallization, John Wiley.
8. Bose M.K. 1987 : Igneous Petrology. World Press.

Paper - V Practical Structural Geology

Map reading and drawing pertaining to conformable series, horizontal, vertical and inclined beds, patterns of dipping strata. Thickness and depth of strata, Determination of thickness of beds by various methods and order of superposition, three point problems.

Study and interpretation of geological maps and sections ; simple, symmetrical, asymmetrical, overturned and isoclinal folds, domes & basins unconformities, overlap-s & offlap sections, faults.

Recording & plotting of field data. Preparation & interpretation of structure contour maps.isopach maps, isochore maps, isolith and isograde maps.

Orthographic projection and geometric solution for fault and three point problems.

Stereographic solution of true dip and apparent dip, plunge and rake of intersection of two planes and fold axis of plunging fold, fault problems.

Study of large scale tectonic features of the earth.

Paper-VI Practical crystalography and Mineralogy crystallography.

Study of important forms of cubic, tetragonal, hexagonal, orthorhombic, monoclinic, and friclinic study of twinning in crystals of various systems.

Stereographic projections of important forms of cubic, tetragonal and orthorhombic crystals.

Calculation of axial ratio & zone symbols in tetragonal, hexogonal and orthorhombic crystals

Mineralogy

A study of megascopic and microscopic characters of more important rock forming minerals. Determination of refrengence by immersion method using Becks effect, interference colours, pleochroic scheme of biaxial minerals.

Study of conoscopic figures of uniaxial kand biaxial crystals using optic axial and acute bisectrix figures.

Determination of extinction angle using sensitive tint plate.

Determination of optic axial angle on the universal stage.

Paper-VII Practical Petrology

1. Megascopic and microscopic study of Igneous rocks.
2. Megascopic and microscopic study of Metamorphic rocks of different facies.
3. Interpretation of reaction textures.
4. Structures of metamorphic rocks in hand specimen and in thin section.
5. Study of typical rock assemblages in hand specimens and in thin section and their petrogenetic interpretation.
6. Interpretation of chemical analysis of rocks.