F.Y. B.Sc. Syllabus Revision Workshop
(29^{th} – 30^{th} June 2007)
Held at STES's Sinhgad College of Science, Pune-411 041

Paper I: Mineralogy and Petrology

Term I

Sr.No	Topic	No. of Lectures
1	**Introduction:** Definition, branches and scope of mineralogy. Importance and conservation of minerals.	(2)
2	**Formation of minerals:** Introduction and description of geological processes of mineral formation a. Crystallization from melt b. Crystallization from Solution (Evaporation and precipitation) c. Crystallization from Vapour (Sublimation) d. Metamorphic processes e. Alteration and related weathering (oxidation and supergene enrichment)	(5)
3	**Crystal Chemistry** a. Atoms, ions and the periodic table b. Bonding forces in crystals:- ionic, Covalent, Vander Waal's and metallic bonds, crystals with more than one type of bond c. Major element constituents of minerals d. Geochemical affinity & classification of elements e. Geometrical and electrical stability of minerals (concept of relative size of ions, radius, ratios, co-ordination number & ionic substitution)	(12)

	f. Isomorphism, polymorphism, pseudomorphism g. Silicate structures	
4	**Physical properties of minerals** a. Colour, streak, lustre, cleavage, fracture, hardness, form, magnetism, electrical property, radio activity, specific gravity & luminescence (Phosphorescence and Fluorescence) b. Methods of determining specific gravity – Chemical balance, Walker's steelyard, Jolly's spring balance, pycnometer, heavy liquids	**(7)**
5	**Optical mineralogy** a. Nature of light – ordinary and plane polarized light b. Double refraction of light (with the help of calcite crystals) c. Nicol's prism and polaroids d. Petrological microscope e. Introduction to optical properties – 1. In plane polarized light: Colour, shape, cleavage, relief/ twinkling, pleochroism 2. Between Crossed polaroids: isomorphism, anisomorphism, Extinction position, interference colours, twinning.	**(8)**
6	**Crystallography** a. Definition and conditions conducive for the formation of crystals, crystal habits and aggregates b. Crystal morphology – faces, forms, edges, solid angles, interfacial angle and its measurement by contact Goniometer, law of constancy of interfacial angle c. Symmetry of crystals – Plane, axis and centre of symmetry, crystallographic and geometrical	**(8)**

	symmetry. Crystallographic axes, lettering and order of crystallographic axes, parameters, axial ratio, indices, parameter system of Weiss, index system of Miller, Law of rational indices d. Classification of crystals based on their elements of symmetry and crystallographic axes. The study of following crystal systems – i. Orthorhombic (Type: Barytes) ii. Tetragonal (Type: Zircon) iii. Cubic (Type: Galena) iv. Hexagonal (Type: Beryl) v. Monoclinic (Type: Gypsum) vi. Triclinic (Type: Axinite) Comparative studies of all the six crystallographic systems	
	Total Number of Lectures	**(42)**

Paper I: Mineralogy and Petrology

Term II

	MINERALOGY (Contd)	
Sr.No	**Topic**	**No. of Lectures**
7	**Introduction to Rock forming and Industrial minerals** a. Study of following minerals with reference to their Silicate structures, chemical composition, physical and optical properties: Quartz, Orthoclase, Microcline, Plagioclase, Olivine, Augite, Hornblende, Muscovite, Biotite b. Study of minerals used in various industries viz. Ceramics, Refractory, Paints, Glass, Cement and fertilizers.	**(5)**
	PETROLOGY	
8	**Definition and major divisions** a. Definition of petrology, lithology, petrography, petrogenesis b. Major divisions and diagnostic characteristic of rocks : igneous, sedimentary and metamorphic c. Rock cycle	(2)
	Igneous Petrology	
9	**Magma** a. Magma and its composition b. Pyrogenetic minerals, Bowen's reaction series	(4)

	(sequential crystallization of minerals in the igneous rocks) c. Formation of crystals and glass	
10	**Forms of Igneous bodies** a. Intrusive: Concordant and discordant intrusions 1. Concordant: sills, laccoliths, lopoliths, phaccoliths, concordant batholiths 2. Discordant: dykes and veins, cone sheets, ring dykes, stock, boss conolith and discordant batholith. b. Extrusive: lava flows, puy	(4)
11	**Textures and Structures** a. Textures, Definition and factors controlling textures: Equigranular (granitic), Inequigranular (porphyritic), glassy b. Structures: Vesicular, amygdaloidal, blocky, pillow, flow and columnar joints c. Distinction between textures and structures.	(4)
12	**Classification of Igneous Rocks** a. Basis of Classification: Colour index, depth of formation, silica percentage and type of feldspar present b. Description and tabular classification of the following igneous rocks : 1. Plutonic : Granite, Syenite, Diorite, Gabbro, Dunite 2. Hypabyssal : Pegmatite, Pitchstone, Dolerite. 3. Volcanic : Rhyolite, Pumice, Basalt	(4)
	Sedimentary Petrology	
13	Sediments, sedimentation, sedimentary environments	(3)

	(definition and types) and formation of sedimentary rocks: denudation, transportation, deposition and lithification	
14	**Textures and structures of sedimentary rocks** a. Clastic and non-clastic textures b. Structures: Lamination, bedding (concordant and discordant), graded bedding and ripple marks	(3)
15	Description and classification of the following secondary rocks: Laterite and Bauxite, Breccia, Conglomerate, Sandstones, shales, Mudstone, Limestones.	(2)
	Metamorphic Petrology	
16	Definition of metamorphism, agents of metamorphism, kinds of metamorphism, Characteristics of different types of metamorphism	(9)
17	Structures in metamorphic rocks: maculose, slaty cleavage, Schistose, Granulose, Gneissose	
18	Classification of metamorphic rocks (based on the original rock, agent/type of metamorphism) and description of following rocks Slate, Marble, Quartzite, Mica Schist, hornblende Schist and Hornblende Gneiss	
	Total Number of Lectures	**40**

Paper II : General Geology and Paleontology

Term I
General Geology

Sr.No	Topic	No. of Lectures
1	**Introduction**: Definition of geology, Its divisions, sub-divisions and scope	(1)
2	**Planet Earth** Origin of the Universe (Big Bang Theory), Origin of the Solar System (Nebular, Encounter and Tidal theory) a. Earth: Its size, shape and density. Temperature, pressure and magnetism within the earth, Present day hypsographic curve b. Age of the Earth: A brief account of the historical methods. Determination of age by the K/Ar and U/Th methods c. Geological Time Scale: Concept and Criteria	(2) (2) (2) (2)
3	a. The Earth's Atmosphere, Hydrosphere, Lithosphere and Biosphere b. Earth's crust, mantle and core	(2)
4	Continental Drift: Concept and Evidence Plate Tectonics: A brief introduction	(4)
	Weathering (mechanical and chemical), erosion,	(4)

5	denudation, soil formation and soil profile.	
6	The dynamics of erosional and depositional landforms resulting from the action of river, wind, sea and glaciers	(12)
7	Concept of Isostacy: Pratt's and Aery's model	(2)
8	Types of Mountains: Fold, fault block, volcanic and residual	(2)
9	Volcanoes: Genesis of volcanoes, Central and fissure type of eruptions. Products of volcanoes, earth's volcanic belts.	(3)
10	Earthquakes: Definition, terminology, causes, intensity and magnitude. Recording of earthquakes. Use of seismic waves and their importance in interpreting the earth's internal structure. Seismic zones. History and susceptibility of the Indian subcontinent to earthquakes.	(4)
	Total Number of Lectures	**42**

Term – II
Palaeontology

Sr.No	Topic	No. of Lectures
11	a. Palaeontology: Definition, branches, importance	(2)

	and scope. b. Origin and evolution of life over geological time	(3)
12	Fossils: Definition, conditions and modes of preservation, uses of fossils, techniques used in collection, preservation and illustration of fossils.	(10)
13	Systematic position, morphology of hard parts, geological and geographical distribution of the following: **a. Phylum Mollusca** I. Class: lamellibranchia or Bivalvia: Morphology of hard parts of the shell and ornamentation and type of hinge lines. II. Class: Gastropoda: Morphology of hard parts of the shell and forms of the gastropod shell III. Class Cephalopoda: Morphology of hard parts of Nautilus, Ammonoid, Belemnites and type of suture lines IV. Comparison between Nautilus and Ammonoids **b**. **Phylum Brachiopoda** Morpholopgy of hard parts of class articulate and inarticulate. Types of brachial skeleton **c. Phylum Echinodermata** Class Echinoidea, morphology of hard parts of regularia and irregularia. Variation in the apical disc in echinoids **d. Phylum Arthropoda** Class Trilobita – Morphology of hard parts of trilobites, types of facial sutures, conditions of pygidium. **e. Phylum Coelenterata** Class Anthozoa	(3) (3) (5) (3) (3) (4) (2)

	Madreporaria, polyp, medusa, types of septa	
	Total Number of Lectures	**38**

Paper III: Practical (Total No. of practicals: 22)

1	**Mineralogy** **A.** Physical properties of minerals Colour, form, streak, luster, cleavage, fracture, hardness and specific gravity **B.** Identification of following minerals (With the help of physical properties) Quartz, Rock crystal, Rose Quartz, Milky Quartz, Smoky quartz, Amethyst, Chalcedony, Agate, Jasper, Flint, Opal, Orthoclase, Plagioclase, Biotite, Muscovite, Garnet, Olivine, Hornblende, Apophyllite, Stilbite, Kyanite, Talc, Calcite, Fluorite, Gypsum, Barytes, Magnetite, Haematite, Chromite, Chalcopyrite, Galena, Pyrolusite, Bauxite, Graphite.
2	**Experiment** To find out the specific gravity of minerals using Walker's Steel Yard.
3	**Crystallography** Study of elements of symmetry, crystallographic axes and forms with indices of the following crystal systems (Minimum 3 models of each system) a) Orthorhombic System (Type: Baryte) b) Tetragonal System (Type: Zircon)

	c) Cubic system (Type: Galena) d) Hexagonal System (Type: Beryl) e) Monoclinic System (Type: Gypsum) f) Triclinic System (Type: Axinite)
4	Measurement of interfacial angle with Contact Goniometer
5	**Optical Mineralogy** Study of optical properties of minerals in plane polarised light and between crossed nicols Identification of the following minerals: Olivine, augite, hornblende, microcline, plagioclase, muscovite, biotite, calcite, garnet
6	**Palaeontology** Study of at least two specimens from each Phylum/Class (Total number of specimens should not be less than 15) a. Phylum MoIlusca – Class Lamellibranchia, Class Gastropoda, Class Cephalopoda b. Phylum Brachiopoda c. Phylum Echinodermata d. Phylum Arthropoda e. Phylum Coelenterata
7	**Petrology** Megascopic study of the following rocks a. **Igneous**: Granite, gabbro, rhyolite, basalt (its varieties), pegmatite (Classification based on colour index, mineral composition and texture) b. **Secondary**: Laterite, bauxite, breccia, conglomerate, sandstones, shales, mudstone and limestones.

	c. **Metamorphic**: Slate, marble, quartzite, mica schist and hornblende schist, mica gneiss and hornblende gneiss.
8	**Toposheets:** Reading of Toposheets – With reference to Toposheet number, Latitude and Longitude, State/District, Scale, Adjacent Toposheet numbers and Conventional Signs
9	Introduction to topographic and geological maps with horizontal beds.
10	Geological Fieldwork to be conducted in an area of geological interest for at least two days and geological report to be submitted for the same.
	Total Number of Practicals - 22

Reference Books:

1. Rutley's Elements of Mineralogy : H.H. Read
2. Text Book of Mineralogy: Dana and Ford
3. Rock Forming Minerals: Deer, Howie, Zussman
4. Manual of Mineralogy: Cornelius, S. Hurlbut and Cornel Klein
5. Principles of Mineralogy: W.H. Blackburn, W.H. Denman
6. Mineralogy: Berry Mason, Dietrich
7. Principles of Petrology: Tyrrell
8. Invertebrate Palaeontology: Henry Woods
9. General Geology: Radhakrishnan
10. Holmes'Principles of Physical Geology: Edited by P. McL. D. Duff