

## Solapur University, Solapur

### Syllabus for B.Sc. II- Geochemistry - (IDS)

#### Semester System - CGPA

To be implemented from Academic Year- 2015 - 16

Course Structure –Total Credit 16 - (Theory (4 x 3) = 12+Practical 1x 4=4)

Sr. No.	Semester	Paper No.	Title	No. of Lecture	Total Marks (External + Internal)
1	Semester III	I	Introduction to Geochemistry	45	100 = 70+30
		II	Introduction to Solar system and Geo-spheres	45	100 = 70+30
2	Semester IV	III	Principles of Geochemistry	45	100 = 70+30
		IV	Chemistry of the Earth	45	100 = 70+30
3	Semester III and IV	Practical course	Practical Examination (Two Days) (Annual Pattern)		200 = 140 + 60
				Total	600 = 420 +180

### IMPORTANT TO NOTE

- ✓ 70 marks for university exams + 30 marks internal exams
- ✓ Minimum passing percentage = 40%
- ✓ Separate passing for both university and internal examinations in Theory and Practical

# Solapur University, Solapur

## Syllabus of Geochemistry B.Sc. II - IDS (Inter-disciplinary subject)

### Theory

### Semester -III

#### **Paper- I: Introduction to Geochemistry (70 Marks) (credit 3) (45 Periods)**

- Unit 1- Gibbs phase rule, one component system (water and sulphur), Goldschmidt's Mineralogical phase rule (12 periods)
- Unit 2- The states of matter, the crystalline state, principles of crystal structure, formation of Crystal, lattice energy of crystals, radius ratio, coordination number, structure of Sodium Chloride, Cesium Chloride, Zinc Sulphide. Brief idea of radii of common ions in rock forming minerals. General rules of the three dimensional structure with the help of solid geometry (11 periods)
- Unit 3- Covalent bonds, general rules of bond type, electro negativity, atomic substitution (11 periods)
- Unit 4- Silicate structures, Isomorphism, Polymorphism (11 periods)

#### **Reference Books:**

- 1 Brian Mason and C.B. Moore - Principles of Geochemistry
- 2 H.H. Read (ed.) - Rutley's Elements of Mineralogy
- 3 Krauskopf - Introduction to Geochemistry

#### **Paper II - Introduction to solar system and Geo-spheres (70 Marks) (credit 3) (45 Periods)**

- Unit 1- Nature of solar system, composition of the sun; Composition of Meteorites and their types; Cosmic abundance of the elements (12 periods)
- Unit 2- Zonal structure of the earth, Composition of the crust; Composition of the earth as a whole; primary differentiation of the elements, geochemical classification of the elements (11 periods)
- Unit 3- Structure of atmosphere, composition of the atmosphere, variable constituents of the atmosphere; Evolution of the atmosphere and composition of the primeval atmosphere; Atmospheric additions and losses during geological time (11 periods)
- Unit 4- Nature of the hydrosphere, composition of seawater, composition of terrestrial waters; Gains and losses of elements in the oceanic water. (11 periods)

#### **Reference Books:**

- 1 Brian Mason and C.B. Moore - Principles of Geochemistry
- 2 Krauskopf - Introduction to Geochemistry
- 3 Standard Manuals - Procedures for analysis and estimations of ores, minerals & rocks

## Semester- IV

### **Paper –III: Principles of Geochemistry (70 Marks) (credit 3) (45 Periods)**

- Unit 1- Chemical equilibrium - The law of mass action, an example of equilibrium, hydrogen chloride, the effect of temperature, other examples as CO<sub>2</sub> in water and calcium sulphate. Le chatelier's rule, stability, conventions of chemical equilibrium (12 periods)
- Unit 2- Acids and bases, Chemical definition, Geologic usage, pH, Hydrolysis of Na<sub>2</sub>CO<sub>3</sub>, Estimating ionic concentration, carbonate equilibrium. Temperature changes; Changes in pressure & organic activity. (11 periods)
- Unit 3- Organic material in sediments; The chemistry of carbon compounds, organic reactions, carbon in rocks, origin of petroleum, origin of coal, organic matter in black shale, carbon compounds as reducing agents. (11 periods)
- Unit 4- Colloids- Definition, properties of colloids like electric charges, ion exchange and stability, kinds of colloidal system, silica as chemical sediment, clay minerals as colloids; Structure and properties of important clay minerals; Classification of clay minerals (11 periods)

#### **Reference Books:**

1. Brian Mason and C.B. Moore - Principles of Geochemistry
2. Krauskopf - Introduction to Geochemistry

### **Paper IV- Chemistry of the Earth (70 Marks) (credit 3) (45 Periods)**

- Unit 1- The earth as a physico-chemical system; Crust as a separate system. Geochemical cycle (9 periods)
- Unit 2- Oxidation potentials- Oxidation and reduction, electrode reactions, standard potentials, use of the table of oxidation potentials; Redox potential, Ionic potential, Hydrogen ion concentration, Limits of pH and Eh in nature, Eh and pH diagrams. (9 periods)
- Unit 3- Formation of clay minerals- Formation, classification, types, composition and properties of soils (9 periods)
- Unit 4- Chemical Weathering - Nature, solution, hydration, oxidation and hydrolysis. Agents of chemical weathering, sequence of mineral alteration (9 periods)
- Unit 5- Environmental pollution: Definition of pollution, Brief introduction to Air, Water and Soil Pollutions (9 periods)

#### **Reference Books:**

- 1 Brian Mason and C.B. Moore - Principles of Geochemistry
- 2 Khopkar S.M. - Environmental Pollution Analysis
- 3 K.S. Valdiya - Environmental Geology (Indian context)
- 4 Krauskopf - Introduction to Geochemistry
- 5 Standard Manuals - Procedures for analysis and estimations of ores, minerals and rocks.

# Syllabus of B Sc. (Part-II) Geochemistry Practical Course

(Marks- 140 + 60 = 200) **Annual Pattern - CGPA**

**Credit: 4**

## **Practical – I**

### **Section A - Volumetric analysis and chromatography**

- 1 Estimation of alumina in ore, Estimation of manganese in ore, Estimation of calcium and magnesium in carbonate rocks. (5 experiments)
- 2 Analysis of natural waters and soils. Estimation of Ca, Mg-carbonates, bicarbonates, chlorides, and sulphates. (5 experiments)
3. Detection of traces of metals by chromatography. (5 experiments)

### **Section –B - Qualitative and Colorimetric Analysis**

- 4 Qualitative analysis of representative ores and minerals. (5 experiments)
- 5 Calorimetric determinations: (5 experiments)
  - a) Estimation of alumina
  - b) Estimation of manganese,
  - c) Estimation of total Iron
  - d) Estimation of copper

## **Practical II**

### **Section C – Mineral and Rock Calculations**

- 1 Pyroxene- Hess calculation from given chemical data. (8 experiments)
- 2 Plagioclase- Feldspar calculations (6 experiments)
- 3 Norm calculations from given chemical data (Persalic type only) (8 experiments)

### **Section D – Mineral identification**

Identification and description of following ores and industrial Minerals - (3 experiments)

Hematite, magnetite, pyrolusite, psilomelane, galena, graphite, chalcopyrite, malachite, chromite, bauxite, bituminous coal, anthracite coal, muscovite, biotite, calcite, dolomite, garnet, quartz, olivine, tourmaline, talc, barytes, kyanite, asbestos, plagioclase, orthoclase, and gypsum.

## **Practical Record**

Record of the practical done by the student should be maintained as a journal and map file must be submitted at the time of annual practical examination.

## **-Examination Structure-**

### **Theory examination**

1. The **Entire Theory examination** will consists of **Four Papers**  
**Two Papers in Each Semester**
  2. **Each paper of 70 marks** - As per University common pattern for Science faculty  
**Time: 3hours**
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### **Annual Practical examination at the end of year (4<sup>th</sup> semester)**

#### **Practical Examination**

**Practical examination will be conducted annually i.e. at the end of fourth semester only.**  
**It will be conducted for total 140 marks**  
**Two separate days for Two Practical (Each practical with 70 marks)**

		<b>1<sup>st</sup> day – Practical I</b>	<b>Total-70 marks</b>	
Section A	A1	Estimation	20 marks	Total 40
	A2	Chromatography	20 marks	
Section B	B1	Colorimetric	20 marks	Total 30
	B2	Qualitative analysis	10 marks	
		<b>2<sup>nd</sup> day- Practical II</b>	<b>Total-70 marks</b>	
Section C	1.	Pyroxene (One example)	15 marks	Total 45
	2.	Norm (One example)	14 marks	
	3.	Feldspars (Two examples)	16 marks	
Section D		Identification of minerals	15 marks	Total 25
		Certified Journal submission	10 marks	