

**Solapur University, Solapur****Syllabus for B.Sc. II- Geochemistry  
(Semester System)****To be implemented from Academic Year- 2011-12****Course Structure**

<b>Sr. No.</b>	<b>Semester</b>	<b>Paper No.</b>	<b>Title</b>	<b>No. of Lecture</b>	<b>Total Marks</b>
1	Semester III	I	Introduction to Geochemistry	40	50
		II	Introduction to solar system and Geo-spheres	40	50
2	Semester IV	III	Principles of Geochemistry	40	50
		IV	Chemistry of the Earth	40	50
3	At the end of IV Semester		Practical Examination (Annual Pattern)		100
				Total	300

**Solapur University, Solapur****(Interdisciplinary subject)****Syllabus of Geochemistry at B.Sc. II**To be implemented from **June 2011****Theory****Semester -III****Paper- I: Introduction to Geochemistry (50 Marks)**  
(40 Periods)

- 1) Gibbs phase rule, one component system (water and sulphur), Goldschmidt's Mineralogical phase rule. (10periods)
- 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, caesium 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 (10periods)
- 3) Covalent bonds, general rules of bond type, electro negativity, atomic substitution (10periods)
- 4) Silicate structures, Isomorphism, Polymorphism. (10periods)

**Paper II- Introduction to solar system and Geo-spheres (50 Marks)**  
(40 Periods)

- 1) Nature of solar system, composition of the sun; Composition of Meteorites and their types. Cosmic abundance of the elements. (10periods)
- 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. (10periods)
- 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. (10periods)
- 4) Nature of the hydrosphere, composition of seawater, composition of terrestrial waters. Gains and losses of elements in the oceanic water. (10periods)

**Reference Books:**

- 1 Brian Mason and C.B. Moore - Principles of Geochemistry
- 2 Krauskopf - Introduction to Geochemistry
- 3 H.H. Read (ed.) - Rutley's Elements of Mineralogy.
- 4 Standard Manuals - Procedures for analysis and estimations of ores, minerals & rocks.

**Semester- IV****Paper –III: Principles of Geochemistry****(50 Marks)**  
(40 Periods)

- 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. (10periods)
- 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. (10periods)
- 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. (10periods)
- 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. (10periods)

**Paper IV- Chemistry of the Earth****(50 Marks)**  
(40 Periods)

- 1) The earth as a physico-chemical system. Crust as a separate system. Geochemical cycle. (8periods)
- 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. (8periods)
- 3) Formation of clay minerals- Formation, classification, types, composition and properties of soils. (8periods)
- 4) Chemical Weathering - Nature, solution, hydration, oxidation and hydrolysis. Agents of chemical weathering, sequence of mineral alteration. (8periods)
- 5) Environmental pollution: Definition of pollution, Brief introduction to Air, Water and Soil Pollutions. (8periods)

**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.
- 4 K.S. Valdiya - Environmental Geology (Indian context)
- 5 Khopkar S.M. - Environmental Pollution Analysis

**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.

**- Examination Structure -**

1 The **Entire Theory examination** will consists of **Four Papers**.

**Two Papers in Each Semester.**

2 **Each paper of 50 marks**

3 **Nature of Theory Question Paper: (All questions are compulsory)**

**Time: 2hours**

**Total marks: 50**

- |                |   |             |
|----------------|---|-------------|
| <b>Q.No.1)</b> | <b>Multiple choice questions.</b>             | <b>(10)</b> |
|                | 1) -----                                      |             |
|                | a)      b)      c)      d)                    |             |
|                | 2)  |             |
|                | 3)  |             |
|                | 4)  |             |
|                | 5)  |             |
|                | 6)  |             |
|                | 7)  |             |
|                | 8)  |             |
|                | 9)  |             |
|                | 10)   |             |
| <b>Q.No.2)</b> | <b>Answer any Five of the following</b>       | <b>(10)</b> |
|                | i)  |             |
|                | ii)   |             |
|                | iii)  |             |
|                | iv)   |             |
|                | v)  |             |
|                | vi)   |             |
| <b>Q.No.3)</b> | <b>A) Answer any Two of the following</b>     | <b>(06)</b> |
|                | i)  |             |
|                | ii)   |             |
|                | iii)  |             |
|                | <b>B) Write the Answer/Solve/Problem/Note</b> | <b>(04)</b> |
| <b>Q.No.4)</b> | <b>Answer any Two of the following</b>        | <b>(10)</b> |
|                | i)  |             |
|                | ii)   |             |
|                | iii)  |             |
| <b>Q.No.5)</b> | <b>Answer any Two of the following</b>        | <b>(10)</b> |
|                | i)  |             |
|                | ii)   |             |
|                | iii)  |             |

### Annual Practical Examination

**The entire practical examination will consist of total 100 marks.**

**Two separate examinations for Two days for**

**Section A and B - on first day (45 marks)**

**Section C and D - on second day (55 marks)**

The distribution of marks for practical is as follows:

Section A	A1	Estimation	12 marks	Total 24
	A2	Chromatography	12 marks	
Section B	B1	Colorimetric	12 marks	Total 21
	B2	Qualitative analysis	09 marks	
Section C		1. Pyroxene (One example)	11 marks	Total 35
		2. Norm (One example)	12 marks	
		3. Feldspars (Two examples)	12 marks	
Section D		Identification of minerals	10 marks	Total 10
		Certified Journal submission	10 marks	