

Lecture Series: SGL 201- Principles of Mineralogy

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
FACULTY OF SCIENCE
DEPARTMENT OF GEOLOGY

PRINCIPLES OF MINERALOGY
SGL 201

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UNIT INTRODUCTION

Welcome to this unit on “Principles of Mineralogy”. This unit, on the subject of mineralogy, is part of the second year degree program offered by the Department of Geology, University of Nairobi. For you to grasp and appreciate fully the contents of this unit, you are expected to have covered the first year unit, SGL 101: “Materials of the Earth” as a prerequisite.

Mineralogy is basically the science of minerals. In this unit, we are going to review the historical perspective of mineralogy and its aesthetic, scientific and economic importance. You will learn more about the mineral’s crystallographic elements and how to determine them. The study of the physical properties of minerals will enable you to make intelligent deductions about its crystal structure and chemical composition. You will learn the basic laws governing the reflection and refraction of light. Having understood these laws, you will learn how to determine and distinguish the characteristic optical properties of isotropic and anisotropic minerals using the petrographic polarizing microscope. You will study and examine more about the minerals chemical composition, their identification and classification, and genesis. In discussing the genesis of minerals, you will learn the mineralogical phase rule and be able to illustrate its application in establishing the various mineral phases under specified conditions of temperature, pressure and chemical composition.

To help you grasp the concepts of this unit, I have provided a series of activities that include short questions, reflective notes, and practical assignments for demonstration. You are advised to take the review questions seriously as they will help you to stay focused on the salient and important points within the subject topics.

During your residential session, you will have the opportunity for a face-to-face encounter with your unit tutor who will assist you to review the topics that are covered in this unit. Practical sessions, which form an integral part of the unit, will be carried out during your residential session. You will require the following materials: a large drawing book, geometrical set, pencil, rubber, ruler, and hand lens.

OBJECTIVES OF THE UNIT

At the end of this unit, you should be able to:

- Review the historical perspective of the science of mineralogy and its aesthetic, scientific and economic importance.
- Describe and illustrate various elements of crystallography.
- Describe the major physical properties of minerals and relate these properties to the nature of the crystals structure and composition.
- Describe the reflection and refraction of light and to explain the use of the optical ellipsoid and optical indicatrix in understanding the behavior of light in isotropic and anisotropic minerals.
- Describe the application of X-ray diffraction method in identification of minerals and inorganic substances.
- Demonstrate the practical usage of the petrological microscope.
- Determine the characteristic optical properties of isotropic and anisotropic minerals using the petrographic polarizing microscope.
- Determine the chemical mineral formula and unit cell content from a given chemical analysis.
- Distinguish various chemical bonds and give an outline the chemical classification of minerals.
- Define and explain the usage of the terms: isostructuralism, isotypism, polymorphism, polytypism and pseudomorphism as used in minerals.
- Define the phase rule and use it to illustrate the stability fields of various mineral phases under specified conditions of temperature, pressure and chemical composition.

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