

Earth Sciences

Brief Preparation Instructions:

- Review your knowledge of the basic structure of the Earth, its layers and interfaces, to be able to identify the functions, basic properties, and compositions of the individual layers.
- Review the basic geological terms and definitions related to historical geology, formation of the Earth, Earth's structure etc.
- Familiarize yourself with basic geography related to oceans and continents, including key numbers and facts about the Earth.
- Focus on Earth's surface and the key concepts and principles related to atmosphere, hydrosphere, pedosphere, and biosphere.

Geological processes and definitions

Brief Preparation Instructions:

- Review basic geological concepts and terminology.
- Applicants should be able to define mineral(s) and rock(s) and describe their basic properties and types.
- Review the geological periods, their sequence, characteristics and key events. Understanding the sequence of geological events requires knowledge of the principle of superposition.
- Focus on basic geological processes, including formation of different rock types, weathering and erosion (processes, factors, impacts).
- Review climate changes in Earth's history to understand the development of ecosystems and the formation of certain geological features.

Mineralogy and petrology

Brief Preparation Instructions:

- Master key mineral groups and basic minerals to know their chemical formulas, structures, and common properties.
- Understand rock types and their formation: Learn the classification and properties of igneous, sedimentary, and metamorphic rocks. Study key examples like basalt (igneous), sandstone (sedimentary), and schist (metamorphic) to recognize their mineral compositions and textures.
- Study crystal formation processes and the basics of crystallography.
- Learn about important properties like hardness, lustre, cleavage, and specific gravity for mineral identification. Practice using Mohs scale of hardness.

Biogeochemical cycles

Brief Preparation Instructions:

- Brush up on foundational concepts in biology, chemistry, geology, and environmental science. A strong grasp of these will help you understand the interdisciplinary nature of biogeochemical cycles.
- Familiarize yourself with major cycles like carbon, nitrogen, phosphorus, sulphur, and water. Understand their sources, pathways, key processes, and the roles they play in regulating ecosystems and climate.

Atmosphere and related environmental issues

Brief Preparation Instructions:

- Follow current events, climate reports, and research on topics like climate change, air pollution, and renewable energy to gain context for your studies.
- Review basic knowledge of the composition, properties, and fundamental functions of the atmosphere.
- Familiarize yourself with atmospheric gases, particles, and pollutants in relation to their environmental interactions and air pollution.

Hydrosphere and related environmental issues

Brief Preparation Instructions:

- Understand water properties: Study the unique characteristics of water, including its molecular structure, polarity, and ability to dissolve various substances, which are critical for environmental and hydrosphere processes.
- Grasp key water quality indicators used to measure organic pollutants in water. Explore the role of carbonates, major and trace elements in water systems.
- Be aware of common groundwater contaminants like risk metals and metalloids.
- Learn water treatment fundamentals: Familiarize yourself with basic processes used in water treatment to remove particles and contaminants.

Pedosphere and related environmental issues

Brief Preparation Instructions:

- Understand the basics of soil composition, formation, and ecology.
- Study how soil science intersects with agriculture, forestry, and environmental conservation to address soil health, soil degradation, and sustainability issues.
- Be aware of common soil organic and inorganic contaminants and their properties

Basic chemistry

Brief Preparation Instructions:

- Master atomic structure fundamentals: Understand the basic components of an atom along with concepts like atomic number, mass number, and electron shells.
- Get familiar with the periodic table: Learn how to read and interpret the periodic table, including element groups, periods, and trends (like atomic size).
- Study how atoms form ions by gaining or losing electrons, resulting in positive or negative charges, and the role of these charges in reactions and bonding.
- Explore types of chemical bonds, including how and why they form between atoms, and the role of electron sharing or transfer in bond formation.

Phases of matter and equilibria

Brief Preparation Instructions:

- Understand the states of matter and phase transitions: Familiarize yourself with the solid, liquid, gas, and plasma states of matter and their physical changes that occur at different temperatures and pressures.
- Explore solubility principles in different solvents, including factors that influence solubility (temperature, polarity, pH), and the principles of chemical equilibria.
- Familiarize yourself with oxidation and reduction processes.

Environmental Pollution

Brief Preparation Instructions:

- Review the sources, types, and impact of greenhouse gases on global climate change.
- Research the principles, advantages, and limitations of renewable energy sources and how they contribute to reducing pollution and greenhouse gas emissions.
- Study air pollutants and airborne particles, their sources and effects on human health and ecosystems.
- Explore water and soil pollution: Learn the sources and impact of sewage and industrial waste on water bodies and soil environments, including the methods to reduce pollution and protect ecosystems.

Recommended resources

Earle, S. (2019). *Physical Geology – 2nd Edition*. Victoria, B.C.: BCcampus. Retrieved from <https://opentextbc.ca/physicalgeology2ed/>.

Andrews, J.E., Brimblecombe, P., Jickells, T.D., Liss, P.S., Reid, B. (2008). *An Introduction to Environmental Chemistry*, United Kingdom, Black Well Publishing

Manahan, Stanley E. (2005). *Environmental chemistry*. New York: CRC, 2005. ISBN 1-56670-633-5.