Environmental Geology 11th edition Montgomery Solutions Manual

SKU: 9780078022951-SOLUTIONS

2 Rocks and Minerals—A First Look

Test Your Learning

1. Briefly define the following terms: *ion, isotope, compound, mineral,* and *rock.*

An ion is an atom that has gained or lost electrons and thus has a net electrical charge. Isotopes are atoms of the same element that have different numbers of neutrons in the nucleus (same atomic number, different atomic mass number). A compound is a chemical combination of two or more elements in definite proportions that has a distinctive set of physical properties. A mineral is a naturally occurring, inorganic, solid element or compound, with a definite composition or range in compositions and a regular internal crystal structure. A rock is a solid, cohesive aggregate of one or more minerals.

2. Know the two properties that uniquely define a specific mineral.

A mineral can be uniquely defined or identified by its chemical composition and its crystal structure, taken together.

3. Give the distinctive chemical characteristics of each of the following mineral groups: silicates, carbonates, sulfides, oxides, and native elements.

The silicates consist of silicon and oxygen and, usually, additional elements. Carbonates contain carbonate (CO_3) groups, with carbon and oxygen in the proportions 1:3. Sulfides contain sulfur but not oxygen (as distinguished from sulfates). The oxides consist of one or more metals plus oxygen but lack the other cations necessary to make them carbonates, sulfates, and so on. Native elements are minerals that consist of a single chemical element.

4. Define *igneous rock* and explain how and why volcanic and plutonic rocks differ in texture.

An igneous rock is one crystallized from a magma (silicate melt). Volcanic rocks are finer-grained than plutonic rocks because plutonic rocks cool and crystallize more slowly, so there is more time for large crystals to develop.

5. Name and briefly describe the two principal classes of sedimentary rocks.

Sedimentary rocks can be subdivided into clastic rocks, formed of fragments of preexisting rocks, and chemical sedimentary rocks, precipitated from solution.

6. Explain how a granite might be transformed into a sedimentary rock.

Weathering and erosion can break the granite down into smaller fragments and individual mineral grains. The resultant bits can be transported, deposited, buried, and lithified to make a (clastic) sedimentary rock.

7. Name several possible sources of the heat or pressure that can cause metamorphism. Describe the kinds of physical changes that may occur in a rock as a result.

Burial provides both increased heat (as a consequence of the geothermal gradient) and increased pressure (from the weight of overlying rocks). Intrusion (hot magma rising in the crust) also elevates temperatures locally, and tectonic activity (such as mountain building) can contribute added stress. Rocks may recrystallize, with crystals growing larger and more tightly interlocking; minerals unstable at higher temperatures and pressures may break down, to be replaced by minerals that are stable under the new conditions; directed stress may produce foliation, the alignment of platy or elongated minerals.

Copyright 2020 © McGraw-Hill Education. All rights reserved. No reproduction or distribution without the prior written consent of McGraw-Hill Education.

Environmental Geology 11th edition Montgomery Solutions Manual

8. Briefly outline the rock cycle, indicating the kinds of processes that can lead to transformation of one rock into another.

The rock cycle is the concept that rocks are continually involved in a process of reworking and change, with rock and mineral materials constantly being transformed through the action of geologic processes. Weathering of preexisting rock produces more sediment to become new sedimentary rock, heat and pressure acting on any rock may metamorphose it or even melt it to make new igneous rock, and so on.

Copyright 2020 © McGraw-Hill Education. All rights reserved. No reproduction or distribution without the prior written consent of McGraw-Hill Education.

Environmental Geology 11th edition Montgomery Solutions Manual