

Weathering of the Earth's crust | sample answer

Q: Explain the process(es) of physical weathering and the process(es) of chemical weathering.

The earth's crust is a thin layer of solid land (lithosphere) floating on the mantle (asthenosphere). It is broken into plates and is constantly colliding, separating and moving. It is because of this movement that the landscape we see today is as it is.

Weathering is an exogenic force responsible for shaping and reshaping the landscape that was already made by endogenic forces.

Weathering is the process that breaks down rock into smaller pieces. The rocks are deposited where they fall. Weathering doesn't transport material; gravity or agents of erosion do this.

There are 2 types of weathering; mechanical and chemical. Mechanical weathering is another name for physical weathering. It is the breakdown of rock by wind, water or ice and some times even gravity.

Freeze-thaw action is an example. It occurs where weather temperatures vary above and below freezing and when water is present. Ireland is an example.

Water gathers in cracks in rocks and when it freezes it expands, cracking the rock further. This process repeats and eventually splits rock fragments. These fall as scree.

Another type of mechanical weathering is called onion weathering (exfoliation). This occurs when extreme heat causes rocks to expand and then extreme cold comes a short time later and makes the rock contract slightly. The desert is a good place to see this as the night and day temperatures fluctuate at a huge range.

When the rock contracts slightly, it leaves a thin layer as to where it used to be, so a hollow layer develops and causes the rock to crumble into layer.

Chemical weathering does not involve the elements that physical/ mechanical weathering use. Chemical weathering specifically deals with the various chemical reactions that cause a breakdown of rocks into smaller pieces. It is especially important for the formation of soils.

Chemical weathering happens because water contains many dissolved substances such as CO₂, that can chemically attack rocks.

Sedimentary rocks contain grains bonded together during lithification with cementing agents. The agents are weathered chemically so that sandstone and limestone are weathered quickly.

Carbonation happens when CO₂ gathers in clouds and causes acid rain to fall. The water has to go through soil before reaches the rock and therefore becomes more acidic. Carbonic acid erodes/reacts with the calcium in Limestone and Karst regions (Burren) can form.

Hydration occurs when chemical reactions occur between the rock and the water. The minerals are hydrated and they expand, causing stress and strain within a rock and shattering it.

Oxidation is when rock minerals chemically combine with oxygen (in water or air). Rusting iron is a well-known oxidation process in rocks that contain iron ore.

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Hydrolysis occurs when the H^+ ions from water or weak acid works its way into the minerals in the rock because of its size. The H^+ ions causes the chemical breakdown of the mineral's crystal structure, the most important by products of Hydrolysis are clay materials. Eg Granite's feldspar minerals.