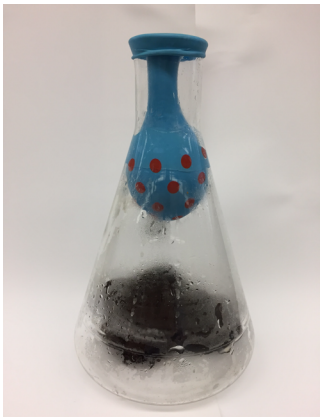
Phenomenon: Oxidation of Iron

This simple demonstration can be used as a phenomenon during a unit on chemical weathering of rocks to activate student thinking about how chemical reactions may change rocks at the Earth's surface. Oxidation is a chemical reaction where an element losses one or more electrons and results in an *increase* in its oxidation state (ex. $Fe^{2+} \rightarrow Fe^{3+}$). For example, iron rust forms when iron is oxidized (forming iron oxide). The top image shows the oxidation of iron nails forming rust. The oxidation of iron and the formation of iron oxides is responsible for the rusty red color commonly found in sedimentary rocks such as the sandstone in the second image. Some minerals in rocks (such as olivine, pyroxene and magnetite) contain iron and *oxidize* in the presence of oxygen from the atmosphere and water at the Earth's surface. The oxidation of iron is accelerated in the presence of acid and salt.

National Park Service Photo

In this demonstration, soak a piece of fine steel wool in vinegar and a pinch of salt for a few minutes. Shake off the excess vinegar and insert the steel wool into an Erlenmeyer flask (1000 ml flask works well). Put a balloon on top of the flask to seal the steel wool inside the flask (bottom left figure). After about an hour, the balloon will be drawn down into the flask as the oxygen in the air reacts with the iron in the steel wool to form iron oxide (bottom right figure). This activity demonstrates that iron reacts with oxygen in the atmosphere to form iron oxide. Likewise, iron-bearing minerals in the Earth's crust may react with oxygen to form iron oxide. After the experiment, the steel wool can be removed from the flask. It will be noticeably rusty in appearance due to the oxidation of iron and the formation of iron oxide.



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