TEACHER'S NOTES 7

WHERE DOES RADON COME FROM?

BACKGROUND

The following level of background information might be considered appropriate, in addition to the material presented in the introduction of the lesson plan.

Rocks are the solid materials, or building blocks, that make up the earth's crust. Each rock is made up of one or more different minerals. For example, granite might be composed of the minerals quartz, orthoclase feldspar, mica, and hornblende. Limestone is an example of a rock that consists of only one kind of mineral: calcite. Although there are 2000 or more kinds of minerals in the earth, only about a dozen or so are common. These include plagioclase feldspar, orthoclase feldspar, quartz, augite, hornblende, and mica.

Each rock type varies somewhat in its mineral content. All granites, for example, contain quartz and feldspar; these are *essential minerals* in granite. Granite may or may not contain hornblende, an *accessory mineral* in granite. Furthermore, the proportions of the different minerals can vary from sample to sample. Thus, granites can be different colors. Those high in quartz and feldspar tend to be lighter in color. Those containing greater amounts of darker minerals, like biotite mica, will be darker in color.

Igneous rocks that harden from magma under the surface are called *intrusive* rocks. Those that form by hardening of lava above ground are called *extrusive*, or volcanic. Intrusive and extrusive igneous rocks differ in texture, which is determined by the size and arrangement of the mineral crystals in the rock. Mineral crystals grow slowly. When the molten rock cools slowly, as is the case below ground, larger crystals are formed. Lava is exposed to the air and cools more quickly, resulting in smaller crystals. Basalt is an example of a fine-grained (small crystals) igneous rock. Obsidian (volcanic glass) cools so quickly that no crystals are formed at all. Granite is a coarse-grain igneous rock.

Groundwater is an important vehicle for transporting geologic materials, including uranium, through rocks and soils. For example, uranium that was deposited on a rock surface during rock formation can be dissolved in water and transported through permeable rocks (e.g., sandstone) and soils. This mechanism allows uranium that was originally deposited in an igneous rock to be transported to another rock type.

WARM-UP

Prior to beginning *Where Does Radon Come From?* bring into class different examples of igneous, sedimentary, and metamorphic rock types.

TEACHING TIPS

It is important to introduce the students to the following basic geological principles and topics prior to beginning this lesson plan:

1. Three basic rock types
2. Difference between rocks and minerals
3. Rock formation processes
4. Movement of geologic materials in groundwater

GROUPING

A large group is suggested so that students can benefit from the comments of their peers during the warm-up activity. Afterwards, students can work in pairs to complete the activity and subsequent analyses.

MINIMUM RECOMMENDED TIME ALLOCATION

One class period.

LEARNING PROCESS SKILLS

Science	Math	Social Stidies	Social or Group
Communicating Inferring Categorizing Applying	Classifying Investigating Analyzing	Judging information related to a problem	Collaborating with others

STUDENT RESPONSES

Question 2: The students' answers could include discussion of such topics as igneous intrusion to form the granite, erosion to form the valley, sedimentation processes in an ocean, subsequent uplift or recession of the ocean, fracturing of the granite via uplift, and metamorphosis of sedimentary materials to form slate.

Question 3: Radon gas has to make its way from its ultimate source (uranium) to the surface. Impermeable materials, such as layers of shale or slate, will inhibit radon movement. Permeability will also influence the movement of uranium dissolved in water downhill through the sandstone layers, thus making possible direct movement upward of radon produced from uranium in the sandstone.

Question 4: House B - close to uranium-rich granite; fractures allow radon gas produced deep in the rock formation to leak to the surface; shallow soil; no impediment to radon movement.

Question 5: Relatively impermeable layer of shale prevents movement of radon up to house from underlying granite.

Radon Alert
Lesson Plan Evaluation Sheet
and FREE POSTER AND STORYBOOK offer

The New Jersey Department of Environmental Protection is happy to provide these lesson plans for use by teachers. In order to evaluate the use of the lesson plans, we would greatly appreciate your response to the following questions. All teachers who return these forms will receive a FREE RADON POSTER depicting information about radon in a colorful format and a STORYBOOK about a Native American child and his experience with radon in his home.

1. Which Radon Alert lesson plan(s) did you use?

_____

2. How useful did you find it/them (check one) ?

___ Not useful
___ Slightly useful
___ Moderately useful
___ Very useful
___ Extremely useful

3. Do you plan to use them again in the future? ___Yes ___ No

4. In your view, what would make the lesson plans MORE useful:

Your name:_____ Phone Number: _____

Subject area: _____Grade:_____

Mailing address:

_____

_____

To receive your FREE RADON POSTER and STORYBOOK, mail or fax this completed form to:
NJDEP Radon Program, P. O. Box 415, Trenton, NJ 08625
Fax: 609-984-5595.

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