

**TEACHER'S NOTES 4****WHAT IS RADON?****BACKGROUND**

Students may have questions about the relationship among the radioactive substances in the uranium-238 decay series. Each time an alpha particle is emitted during the series, the number of protons decreases by 2 and the number of neutrons decreases by 2. This is because an alpha particle consists of 2 protons and 2 neutrons. The atomic number is simply the number of protons. The mass number (i.e., the 238 in uranium-238) is simply the number of protons *plus* the number of neutrons.

Each time a beta particle is emitted, the mass number stays the same because no protons or neutrons are emitted; a beta particle is essentially just an electron, with very slight mass and a negative charge. The atomic number increases by one with beta emission. This can be thought of as a conversion of one neutron into one proton to compensate for the loss of the negatively-charged beta particle. Thus, even though the atomic number changes, the mass number stays the same during beta emission. You may or may not want to discuss with the students these changes that are occurring inside the nucleus when a radioactive decay occurs. The topic is fairly complicated, but quite interesting.

The half-life of each element is given below its symbol in the figure. Half-life is an extremely important characteristic of each element, and a fairly difficult one for students to grasp (see Lesson Plan 2).

**WARM-UP**

Prior to beginning *What is Radon?* introduce students to the periodic table. Have students find patterns in the table for different elements.

**TEACHING TIPS**

Review with students basic atomic structure (e.g. protons, neutrons, and electrons) and the differences between stable and unstable elements.

**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 Studies

Social or Group

Communicating  
Inferring  
Ordering  
Applying

Investigating  
Analyzing

Judging informa-  
tion related to  
a problem

Collaborating with  
others

**STUDENT RESPONSES**

Question 3: Radon would be a *lesser* health threat if the half-life was either very short (it would not make its way out of the soil before being transformed from a gas to a solid) or very long (it would escape from the house before it decayed to polonium).

Question 5: Use essentially the same reasoning as in Question 1. The polonium would likely be cleared from the lungs prior to emitting its radioactivity if the half-life was as long as 20 days. Remember that it is the radioactive emission *inside the lungs* that causes the problem.

Question 7: The properties of radon that contribute to its importance as a health concern include:

- it is a gas and can escape from soil into the house

- it has a medium-length half-life relative to the movement of gas (air) into and out of the house

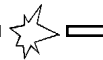
- it decays to form a solid that can lodge in the lungs

- its immediate decay product has a high-energy (potentially damaging) alpha emission

- its immediate decay product has a short half-life, and therefore has a high probability of decaying while inside the lungs

**EXTENDED ACTIVITIES**

1. Have students research the origin of key terms used in this lesson plan and throughout the teacher's guide (e.g., radon, radioactivity, isotope, curie, electron, etc.)
2. Have students conduct an electronic (computer) literature search for an aspect of the radon issue, such as mitigation techniques, measurement devices, or health effects.





**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:**

\_\_\_\_\_

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**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.**

**(Questions? Call the Radon Program at 1-800-648-0394.)**