

TEACHER'S NOTES 6**HOW DOES RADON AFFECT HUMAN LUNGS?****BACKGROUND**

The major purposes of the human lung are to bring life-giving oxygen into the body and to rid the body of toxic carbon dioxide wastes. Although the respiratory system is complex, the basic functioning of the lungs, and the respiratory system as a whole, is simple and easily understood. Air enters through the nasal passages, where it is filtered and warmed. A series of passageways lead to tiny sacs in the lungs called alveoli which have very thin walls and are supplied with blood. The transfer of gases (oxygen into the blood and carbon dioxide out of the blood) occurs by simple diffusion. Air is pumped in and out of the system in response to the movement of muscles in the chest cavity. Inside the air passageways (trachea, bronchi, bronchioles) a lining of epithelial cells protect the airways by secreting mucus to help trap foreign substances, which are removed by the beating of tiny hairs called cilia.

As a consequence of the important role played by the respiratory system (exchange of gases between the outside world and the inside of the body), its principal protection against foreign substances cannot be provided by a thick skin, as in the outer body, but rather must be provided by a clearance system like the mucus and ciliary action provided by the epithelial cells. In most cases, this protective system is perfectly adequate. In the case of some cancer-producing substances, such as cigarette smoke and radon, it is not.

In this exercise, students will explore the anatomy of the human respiratory system and elements of that anatomy that predispose the lungs to potential damage from radon and cigarette smoke.

WARM-UP

Prior to beginning *How Does Radon Affect Human Lungs?* take the class outside for a demonstration of energy sources using different sizes of bats ranging from a small stick to a Louisville slugger. Students should readily notice the distance a softball flies when struck with a small stick versus a baseball bat.

TEACHING TIPS

Discuss with students different units of measurement before they begin this activity. In this manner, units involving microns and electron volts will not be so imposing.

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

<u>Science</u>	<u>Math</u>	<u>Social Studies</u>	<u>Social or Group</u>
Communicating	Verifying	Judging information related to	Collaborating with others
Inferring	Analyzing	a problem	
Applying			

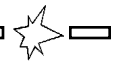
STUDENT RESPONSES

Question 3: Students should consider that half-life is an important consideration because it reflects the probability that a radioactive isotope will emit its radiation while inside the respiratory system. Radon’s half-life is so long (3.8 days) that it would probably be breathed in and then breathed out again before decaying. The half-life of polonium-214 is so short (164 microseconds) that it would not get very far into the system. Unfortunately, polonium-218 has a half-life just about right for maximal damage! The students should also consider that the greater range of penetration (in response to greater alpha energy) of the polonium alphas is potentially more dangerous than the lower energy alpha emitted by radon.

Question 4: Because cancer affects cell division, cells that frequently divide are generally more susceptible to cancer development than cells that divide only infrequently.

EXTENDED ACTIVITIES

1. Have students research different types of lung diseases.
2. Have students design (conceptually) a respiratory system that would be immune to radon and its decay products.





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.

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