



## I. INTRODUCTION TO TEACHERS

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To many people, radiation is something associated with a late-night news story about a nuclear power plant or weapons manufacturing. To the contrary, radiation plays an important role in diagnostic and therapeutic medicine, food preservation, and scientific research. Further, natural radiation is around us 24 hours a day, in the air we breathe, where we live, where we work, and where we play. The sun is a source of natural radiation and everyday geologic processes going on beneath our feet produce different radioactive elements. Worldwide, in some rocks and soils, a radioactive gas called radon is produced and escapes upward into the atmosphere. However, in certain instances this naturally occurring substance can escape from rocks and soils into our homes. In the home it can accumulate to high concentrations in the air we breathe, and this could be dangerous because radon is the second leading cause of lung cancer.

The topic of radon offers a superb opportunity to explore, in the classroom, the links between social studies, science, and language arts. Its social relevance helps to generate student interest. The enclosed activities focus on radon, an unseen, ubiquitous, and potentially dangerous radioactive phenomenon of nature, which is not well understood by the public.

*Radon Alert* contains a series of investigations and extension activities exploring radon and its potential impact on the citizens of New Jersey. The activities have been carefully integrated with the State of New Jersey Core Course Proficiencies for biology, earth science, chemistry/physics, and general academic course work. Each investigation emphasizes data gathering, graphing, and data analysis so that students are able to make inferences and draw conclusions about radon and its economic, political, social, and ethical consequences.

The data used in this teacher's guide represent the latest synthesized research from federal, state and local agencies. The teacher's guide itself includes an introduction to the topic and a collection of 10 lesson plans and numerous extension activities that will help you, the classroom teacher, integrate radon with any thematic area in science, math, social studies, home economics, or language arts. Although the major topics are scientific in nature, the lesson plans and activities have been carefully selected to be integrated into non-science coursework. An important objective of this

program is to make science socially relevant and practical to the students. The material presented in this teacher's guide is intended for use in high school biology classes. The topic is highly interdisciplinary, however, and connections are illustrated between the physical, chemical, biological, and social sciences. Companion teacher's guides focus more specifically on the core course proficiencies in earth science, chemistry/physics, and general academic course work. The section Background Information on Radon (Section III) is fairly comprehensive and detailed. It is intended primarily for use by the teacher, as background information for the completion of the lesson plans.

The series of *Radon Alert* teacher's guides and lesson plans are targeted for classroom instruction at the elementary, junior high, and senior high school levels. All lesson plans take into consideration the broad range of student abilities and background information about radon. At the high school level, *Radon Alert* includes four separate instructional modules covering General Academic, Biology, Earth Science, and Chemistry/Physics. At the junior high level, the lesson plans are comprised of two modules: Science and General Academic. Since most elementary school classrooms are self-contained, the *Radon Alert* lesson plans for this level are comprised of a single document integrating science, mathematics, and whole language instruction.

Regardless of the instructional level, each lesson plan within *Radon Alert* represents a stand-alone activity. Although a specific sequence of lesson plans is recommended, the classroom teacher need not follow this approach. Each *Radon Alert* module includes a core group of activities that can be adapted to a wide range of ability levels and interests. These activities include: What do you think about radon? (survey), What is radioactivity?, What is radon?, and What are our risks from radon?

The team that compiled this workbook hopes the enclosed investigations help to complement your curriculum by offering a set of experiments, surveys, and research data about a topic that is both relevant and practical for student exploration. Hopefully, you and your students will become better informed about this phenomenon of nature and by doing so alert others to one of the unseen risks that we face in our lives today.

**MAJOR PROGRAM OBJECTIVES**

Upon completion of the radon-based lesson plans and extended learning activities that follow, the students will be able to:

1. Describe the interactions between the human respiratory system and airborne contaminants such as radon gas and cigarette smoke
2. Analyze the relationships between DNA, radiation, and cancer
3. Identify elements of the anatomy of the human respiratory system that make it susceptible to damage from radon and its decay products
4. Identify the breakdown process called radioactivity
5. Consider the topic of radiation and the sources of radiation to the American public based on scientific data, rather than irrational fear
6. Identify three types of radiation: alpha, beta, gamma
7. Measure the half-life of radioactive elements
8. Select the most appropriate graph to display specific data
9. Identify how people are exposed to radon
10. Evaluate health risks from radon exposure and other common sources of risk.

