



Geoscape Ottawa-Gatineau

Grade 7 Lesson Plans to accompany the Geoscape Ottawa-Gatineau poster and website
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Theme Eleven: Indoor Radon

List of Expectations		
Grade	Strand and Topic	Expectations
7	Science: Earth and Space Systems The Earth's Crust	<ul style="list-style-type: none"> identify the factors that must be considered in making informed decisions about land use and explain their importance

Overview

The Geoscape "Indoor Radon" theme consists of lessons which will enable students to understand where Radon comes from, how it is formed, and how it affects humans.

At the end of these lessons, students will be able to:

- distinguish between stable and radioactive elements
- recognize some elements in the periodic table with their associated symbols
- be familiar with the radioactive chain reaction that leads to Radon production
- understand the risk factors that may lead to high levels of Radon gas inside buildings

Suggested Lessons	Brief Description
Students Take Notes	Radon Gas: An Invisible Hazard
Key Word Game	Word Search Game
Lesson	Radioactive Chain Reaction Notes from overhead explaining radioactive elements and a worksheet with radioactive elements involved in production of Radon and questions dealing with risk factors in buildings and location
List of related web sites and resources	RADON Guide for Canadian Homeowners (Canada Mortgage and Housing Corporation) http://www.cmhc-schl.gc.ca/ How stuff works site explaining in simpler terms how radon is produced http://home.howstuffworks.com/radon.htm

Students take notes:

Radon Gas: An Invisible Hazard

High levels of radon are associated with lung cancer!

Properties of Radon	Where it comes from	Outdoors (harmless)	Indoors (can be harmful)
<ul style="list-style-type: none">• Odourless• Colourless• Tasteless	Natural breakdown of <u>Uranium</u> found in some rocks or sediments	Radon moves from the ground into the atmosphere	Radon can accumulate to high levels in houses

Radon gas is a hazard that can be controlled.

Radon enters homes through cracks and openings in basement walls and floors.

Radon concentrations can be lowered by:

- sealing entry points
- improving ventilation in the house
- releasing the pressure within the sediments around foundations

Radon is only a hazard in some locations

Concentration of Radon

- depends on local bedrock and sediment and also on building materials (Uranium does not occur in all rocks.)
- geological maps showing concentrations of uranium are used to estimate potential radon accumulation
- direct measurement is the only way to determine the actual concentration

Indoor Radon

U	R	F	O	I	Z	T	M	X	V	E	A	N
U	A	M	D	F	H	D	X	O	T	O	O	R
K	D	E	P	R	E	S	S	U	R	I	Z	E
N	I	G	N	D	R	O	L	D	T	P	P	C
W	O	U	G	J	A	I	T	A	K	F	B	V
D	A	I	R	O	D	L	R	C	H	Y	H	Q
T	C	N	T	A	O	T	O	I	E	D	X	K
K	T	F	Y	A	N	R	P	Y	M	M	O	E
U	I	T	S	E	D	I	M	E	N	T	W	F
S	V	Q	C	E	O	N	U	C	E	L	C	T
G	E	N	B	D	T	K	U	M	Y	I	U	X
D	O	T	P	I	A	R	H	O	Q	N	Q	M
C	K	N	W	O	W	I	J	U	F	L	E	G

1. _____ : solid rock underneath soil and loose sediments
2. _____ : the amount of a given substance in a mixture or solution expressed as a percentage or ppm (parts per million)
3. _____ : decrease the pressure
4. _____ : the process of making a substance thinner or weaker
5. _____ : the part of a building that the ground is in or in contact with
6. _____ : something which emits or gives out harmful radiation
7. _____ : a radioactive gas, element 86
8. _____ : material composed of loose pieces or particles of rocks and minerals
9. _____ : the loose, weathered material containing organic matter, water, and air
10. _____ : a radioactive element found naturally in certain rocks.

Word Search Game Solutions

Indoor Radon

1. Bedrock
2. Concentration
3. Depressurize
4. Dilute
5. Foundation
6. Radon
7. Radioactive
8. Sediment
9. Soil
10. Uranium

11.1 Lesson 1: Radioactive Chain Reactions

Brief Description

This lesson consists of a quick presentation with notes on radioactive elements followed by a worksheet in which students can complete information dealing with the chain reactions from Uranium-238 to Radon.

Suggested Materials

Overhead projector

Overhead: "Radioactive Elements"

Worksheet

Large Periodic table for demonstration

Student Periodic Tables (one per student)

Duration 45 minutes

Lesson Instructions

1. Have students copy notes from provided overhead. Ask student to complete the blank calculation.
 - A half life of 2 days means that it takes 2 days for an initial amount of 1 kg to be reduced to _____ kg. (*1/2 kg*)
2. Briefly explain the symbols on the periodic table and how they pertain to a given name. Most student periodic tables also have a list of elements with symbols and names.
3. Distribute worksheets and have students complete the work.

Radioactive Elements

A periodic table is a chart of all the elements that occur on Earth.

Elements are pure substances and are made up of only one type of atom.

They are considered the building blocks of all matter.

There are just over 100 known elements classified in the periodic table.

Normally a stable element cannot be broken down into smaller substances.

However, some atoms are unstable (or radioactive) and naturally breakdown (decay) into another kind of atoms. The original atom is called the parent; the new atom is called the daughter.

When they break down, alpha or beta particles or gamma rays are also released. This radiation can cause cancer.

Some radioactive elements decay quickly, others more slowly.

- The rate at which they decay is measured as the half life.
- The half life is the time that it takes for half of an initial amount to decay.
- A half life of 2 days means that it takes 2 days for an initial amount of 1 kg to be reduced to _____ kg.
- An element with a short half life decays quickly. An element with a long half life decays slowly.

Radioactive Chain Reaction

Part One:

This is the chain reaction showing how Radon gas is formed from Uranium.

Radioactive Element Name	Element Symbol	How it breaks down	Half-Life
uranium-238		alpha particle thorium-234 atom	4.5 billion years
thorium-234		beta particle gamma ray, protactinium-234 atom.	24.5 days
protactinium-234		beta particle gamma ray, thorium-230 atom.	269,000 years
thorium-230		alpha particle gamma ray radium-226 atom.	83,000 years
radium-226		alpha particle gamma ray, radon-222 atom.	1,590 years
radon-222		alpha particle polonium-218.	3.825 days

1. Using the periodic table, find the code that corresponds to the radioactive element name.
2. Which element has the longest half-life?
3. Which element has the shortest half-life?
4. Which element decays more quickly?

Student Worksheet:

Part Two

1. Is uranium found in all rocks?
2. Is radon a hazard in all parts of the geoscape? Why or why not?

3. In the summer time, you spend most of your time at your family's cottage. The cottage does not have a basement and has old windows and doors that do not seal very well. Should you worry about high Radon levels?

4. Your grandmother has just changed the windows and doors in her house since the old ones did not seal very well. She does not go outside very much. The basement walls have many cracks in them. She doesn't know about indoor Radon. How would you explain this to her.

5. Look at the map on the Geoscape poster of uranium concentrations near the surface. Where is a high concentration of uranium near Ottawa?

6. You are about to purchase a house. You are worried about the possibility of high levels of Radon indoors. Describe three things you can do.