Overview on Radon Gas

Let's Get Started

You can take as long as you need to complete the course, although we do change passwords from time to time. If your password quits working, please contact us to get a new password.

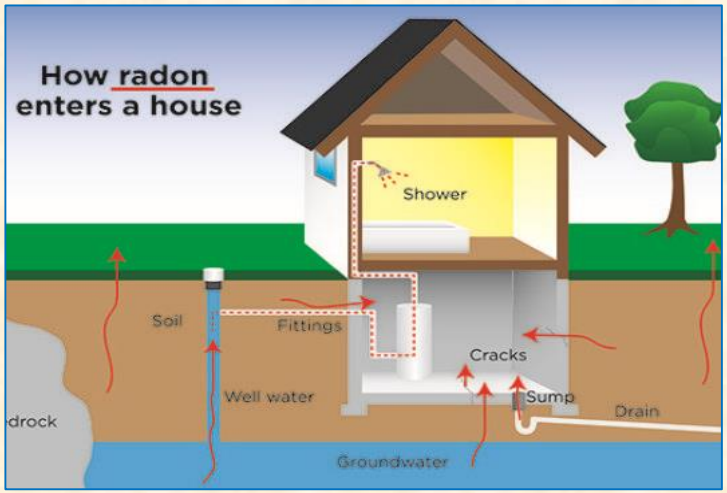
Module 1

In this module, the focus will be on the following topics:

- The health threat represented by radon gas
- How to avoid health complications of radon
- The proper elements of a home inspection
- The science of radon

What is Radon?

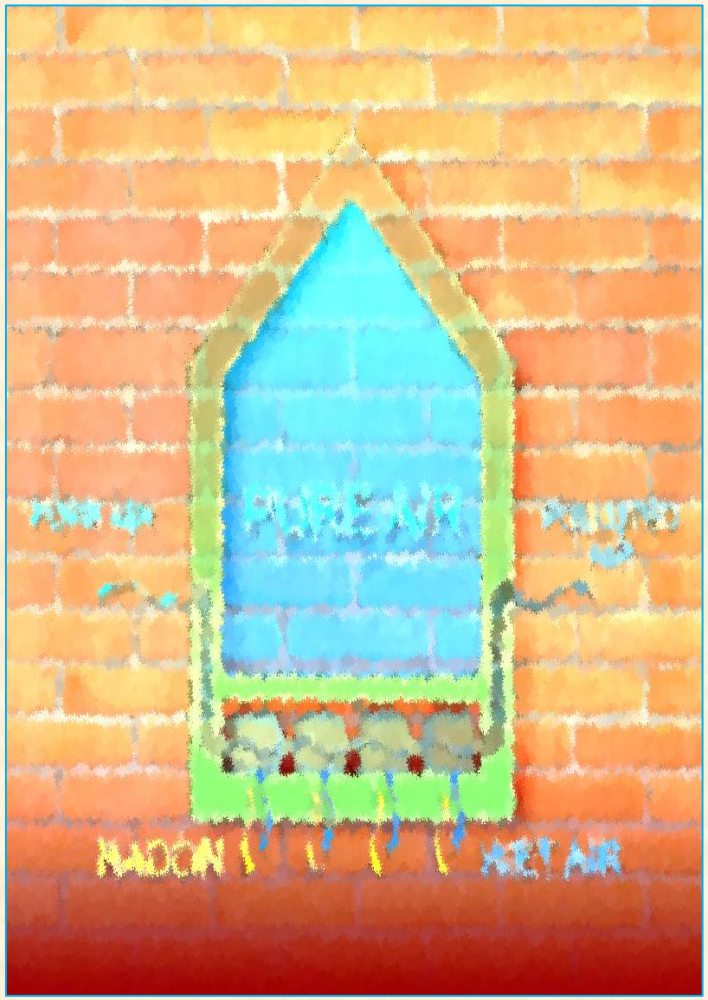
"Radon is a colorless, odorless, tasteless, and chemically inert radioactive gas. It is formed by the natural radioactive decay of uranium in rock, soil, and water. It can be found in all 50 states. Testing for it is the only way of telling how much is present."



Common myths about radon:

If my neighbour's home has radon so will I.
Fact: No, this is not true. All homes are unique.

I've been in my home a long time now and everything seems fine.
Fact: This doesn't mean it is. Only a test can say for sure.



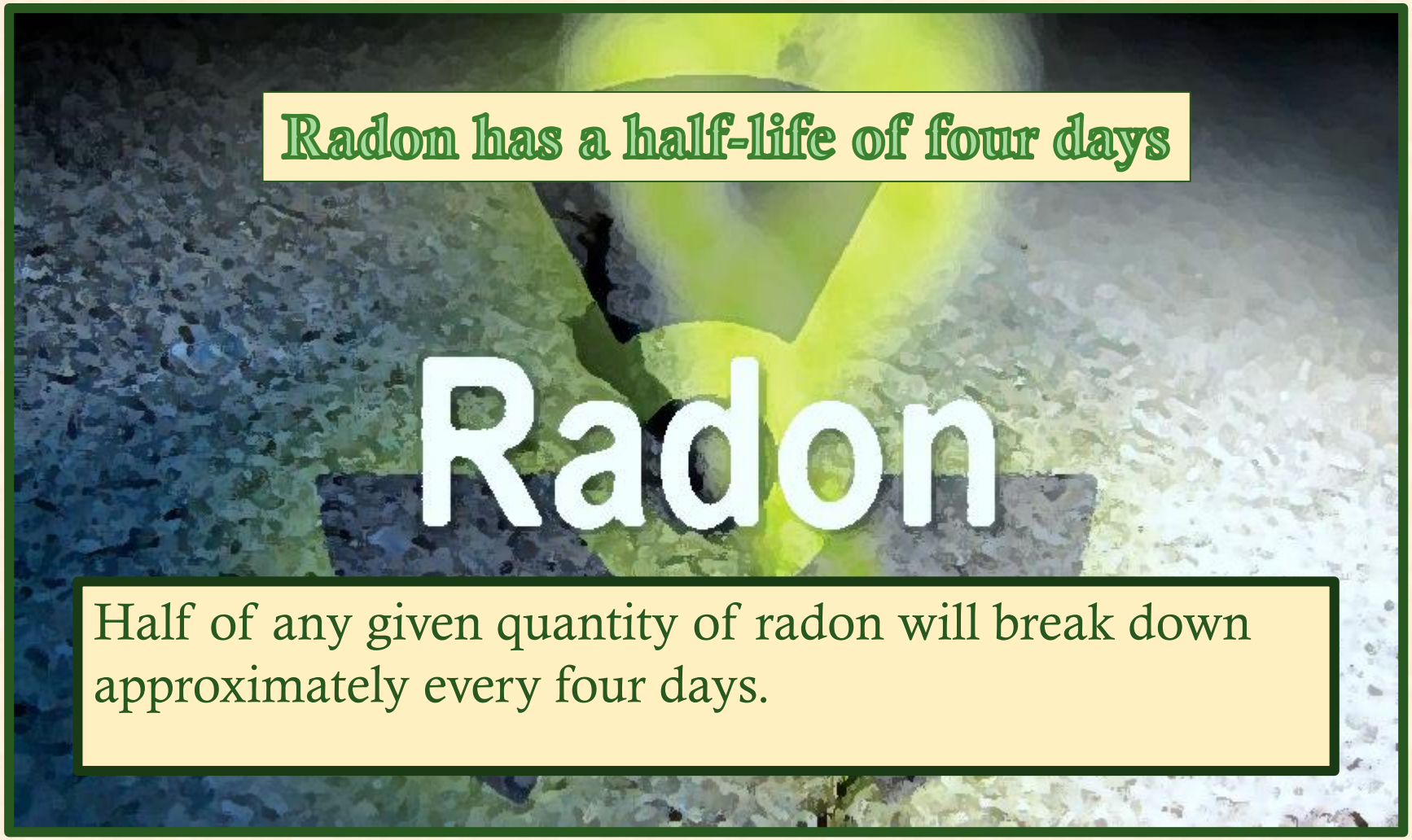
More myths about radon:

Radon testing is difficult, time-consuming and Expensive.
Fact: Radon testing is easy and inexpensive.

Radon testing devices are unreliable, and difficult to find.
Fact: Radon testing devices are easily purchased through
Reliable radon testing companies.

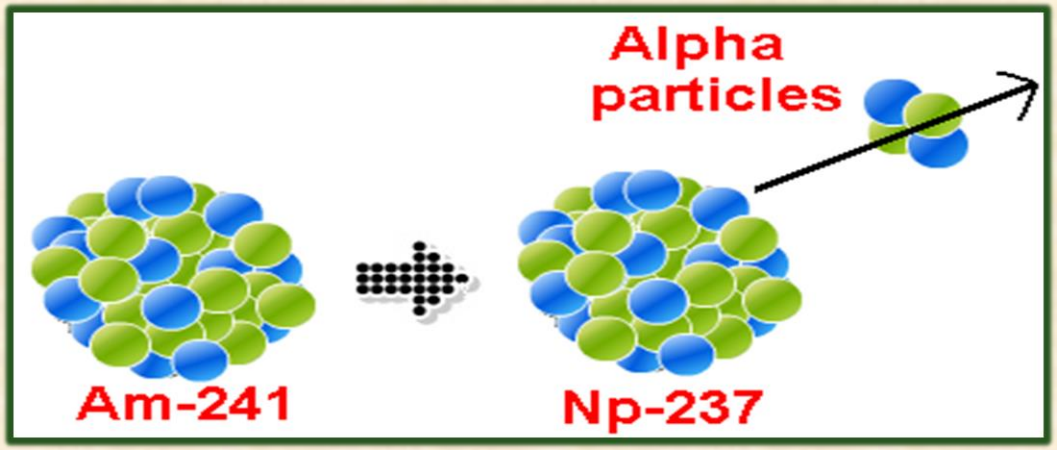
There is much to learn about radon. In the next few slides there will be practical information to assist you in understanding the facts about radon gas, how it enters the home, and the significant health risks that come with it.

Always test for radon!


Radon has a half-life of four days
Radon
Half of any given quantity of radon will break down approximately every four days.

Radon emits alpha particles

When radon undergoes radioactive decay, it emits ionizing radiation in the form of alpha particles. It also produces short-lived decay products, often called progeny or daughters, some of which are also radioactive.



Radon have progeny

Unlike radon, the progeny are not gases and can easily attach to dust and other particles. Those particles can be transported by air and can also be breathed.

The danger of progeny

Radioactivity: Alpha Decay

The decay of progeny continues until stable, non-radioactive progeny are formed. At each step in the decay process, radiation is released.

Understanding radon

- Sometimes, the term radon is used in a broad sense, referring to radon and its radioactive progeny all at once.
- When testing measures radiation from the progeny, rather than radon itself, the measurements are usually expressed in working level (WL) units.
- When radiation from radon is measured directly, the amount is usually expressed in picocuries per liter of air (pCi/L).

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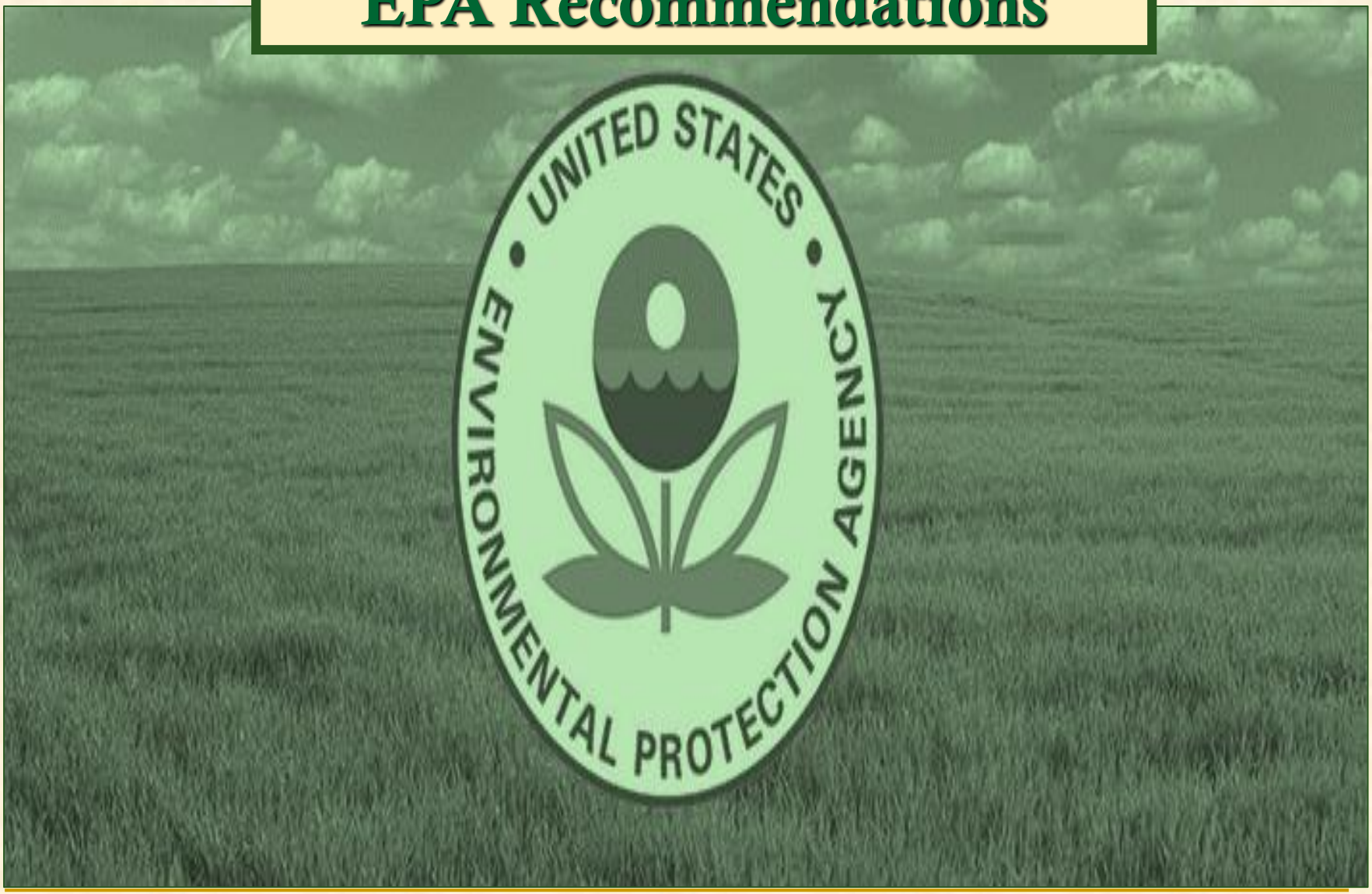
EPA Recommendations



EPA recommends mitigation

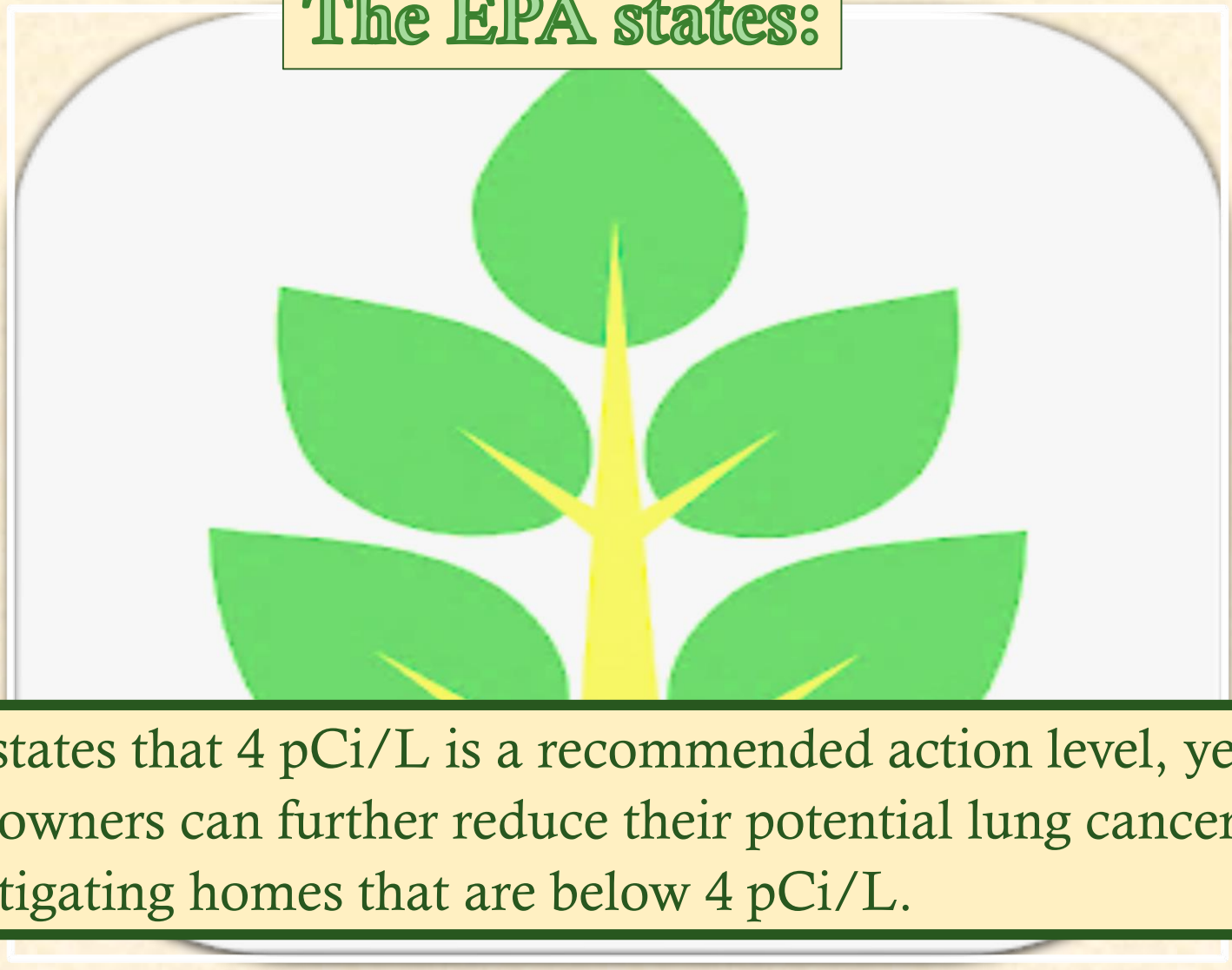
First, at lower levels (2 pCi/L) measurement devices' false negative errors increase threefold, and **false positive errors increase twofold.**

Secondly, mitigation research indicates that elevated levels can be reduced to 4 pCi/L or less **95% of the time.** Research shows that 2 pCi/L can be achieved **70% of the time.**

Mitigation technology works

- Today's mitigation technology can reduce radon levels to between 2 and 4 pci/L most of the time.
- Cost benefit analyses indicate that an action level of 4 pci/L results in a cost of about $700,000 per lung cancer death saved.
- If the action level was set at 3 pci/L, the cost would be $1.7 million, and if set at 2 pci/L, the cost would be $2.4 million per lung cancer death saved.

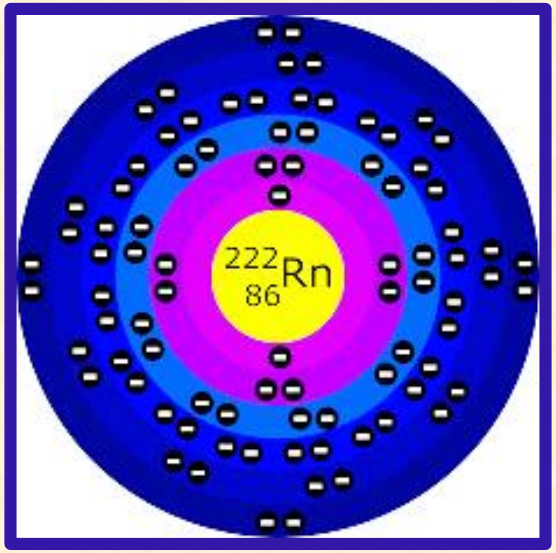
The EPA states:



EPA states that 4 pCi/L is a recommended action level, yet homeowners can further reduce their potential lung cancer risk by mitigating homes that are below 4 pCi/L.

Acceptable levels of radon?

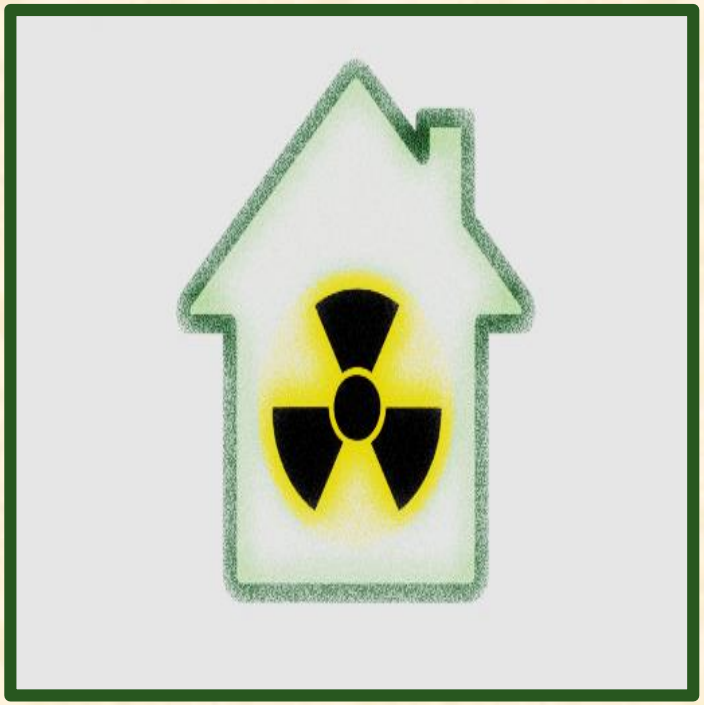
The EPA states that any radon exposure carries some risk; no level of radon exposure is always safe. However, the EPA recommends homes be fixed if an occupant's long-term exposure will average 4 picocuries per liter (pCi/L) or higher.



What is a picocurie?

- A pCi/L is a measure of the rate of radioactive decay of radon. One pCi/L is one trillionth of a Curie, 0.037 disintegrations per second, or 2.22 disintegrations per minute.

- Therefore, at 4 pCi/L (picocuries per liter, the EPA's recommended action level), there will be approximately 12,672 radioactive disintegrations in one liter of air during a 24-hour period.



Measuring radon

Some devices measure radiation from radon decay products, rather than radiation coming directly from radon. Measurements from these devices are often expressed as WL.

WL units & Picocurries

Conversions from WL to pCi/L are usually approximate. A level of 0.02 WL is usually equal to about 4 pCi/L in a typical home.

WL units & Picocurries

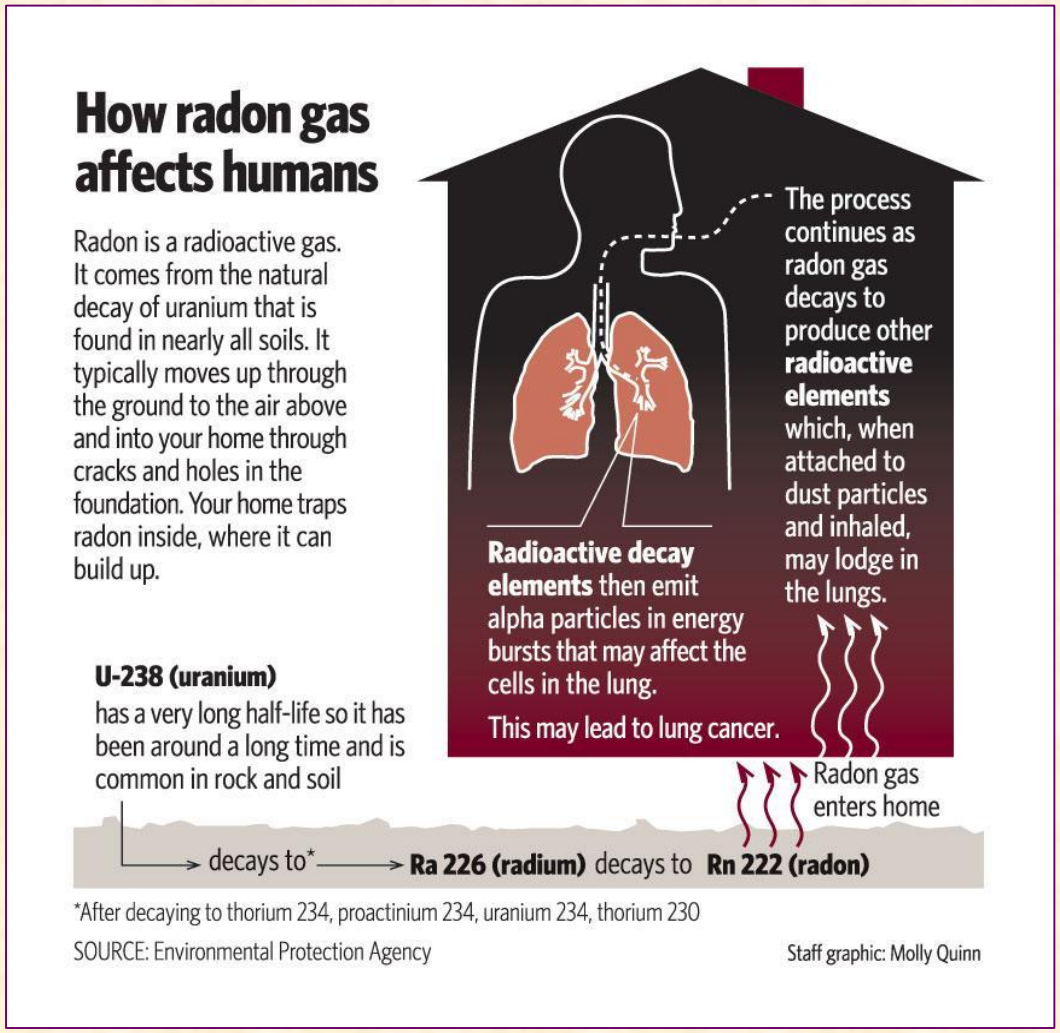
- If a working level (WL) value is converted to a radon level (pCi/L), the conversion is usually approximate and is based on a 50% equilibrium ratio.
- If the actual equilibrium ratio is determined (which is rare), it should be stated.
- The 50% ratio is typical of the home environment, but any indoor environment may have a different and varying relationship between radon and its decay products.

WL Units

Technically speaking, 1 WL represents any combination of short-lived radon decay products in one liter of air that will result in the ultimate emission of 1.3 x 105 MeV of potential alpha energy.

Module 1

Radon is a serious health issue!



Radon is a serious threat to human health. It is the highest cause of lung cancer in the world for non-smokers.

How radon affects our health

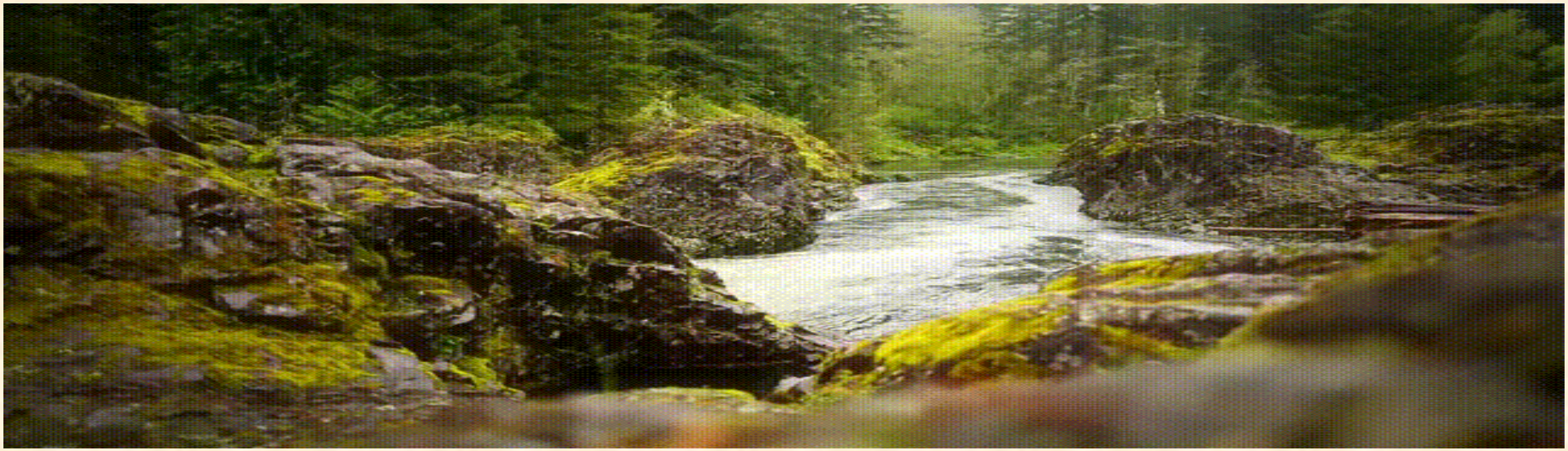
Radon can be a health issue when it's related to:

- The outdoor environment
- Drinking water
- Indoor air

Module 1

Radon in the outdoor environment

- Concentrations vary with soil type, meteorologic conditions and diurnally
- Average ambient outdoor radon levels are about 0.2 - 0.7 pci/L
- Outdoor radon is a small health hazard (700 lung cancer deaths/year, US)



Radon in our drinking water

- Highest concentrations in ground water compared to surface water
- Radon gas emanating from a residential water source produces radon progeny
- Inhaling/ingesting waterborne radon progeny is a very small health hazard

The indoor environment

- Concentrations vary with underlying or surrounding rock or soil type
- Occupational radon levels are highest for miners(uranium, iron and fluorospar)
- Residential radon levels are highest in basements and ground floor rooms
- Average radon level in homes is about 1.25 pci/L
- Radon remediation recommended at residential levels above 4.0 pci/L

What happens if I inhale radon?

The alpha-particle dose delivered to the target cells in the respiratory tract is necessarily modeled on the basis of physical and biologic factors.

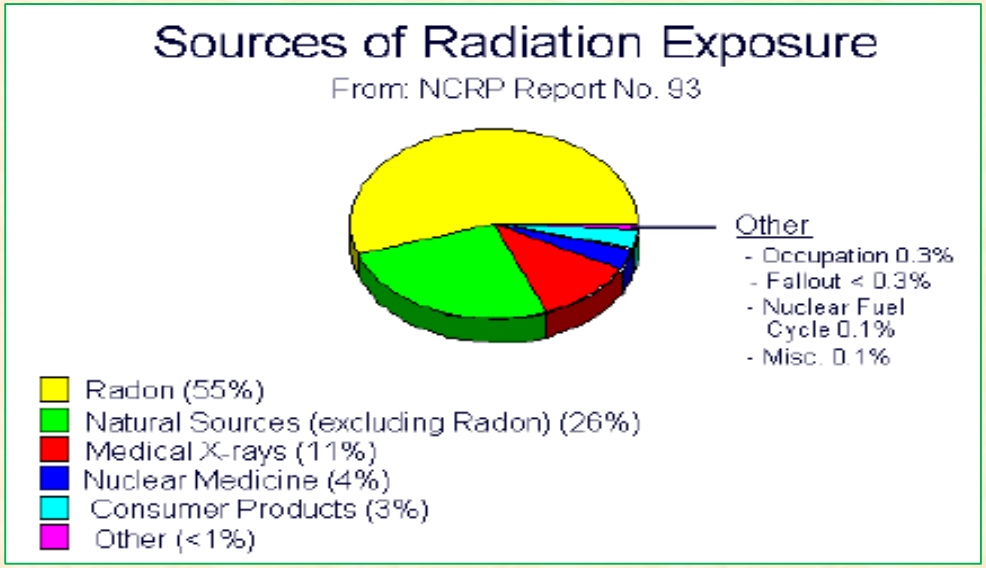
The factors

- Characteristics of inhaled air radon. Progeny that are attached to dust particles deposit much more efficiently than free or unattached progeny
- Amount of air inhaled. The amount and deposition of inhaled radon decay products vary with the flow rate in each airway segment
- Radon concentration in air and duration of exposure
- Equilibrium between radon gas and solid progeny
- Airborne particulate levels

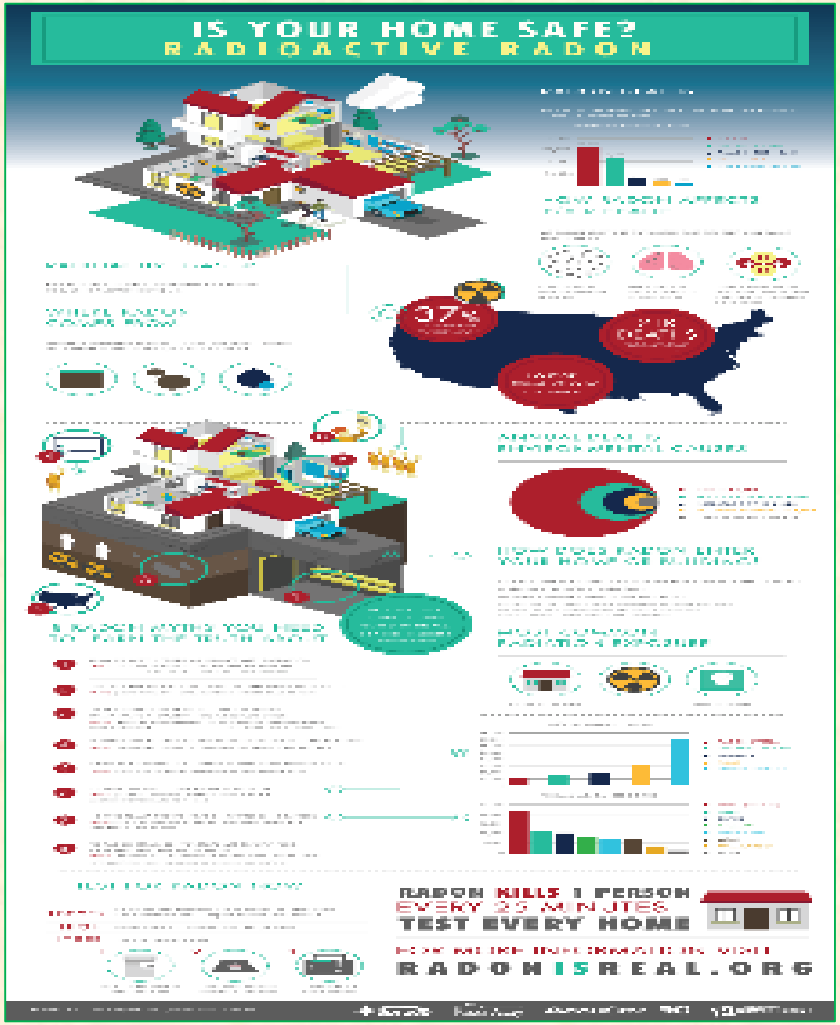
Module 1

The basics of mitigating radon

Radon mitigation is any process used to reduce radon gas concentrations in the breathing zones of occupied buildings, or radon from water supplies. Radon is an important contributor to environmental radioactivity. There will be much more on mitigating radon in Module 2.



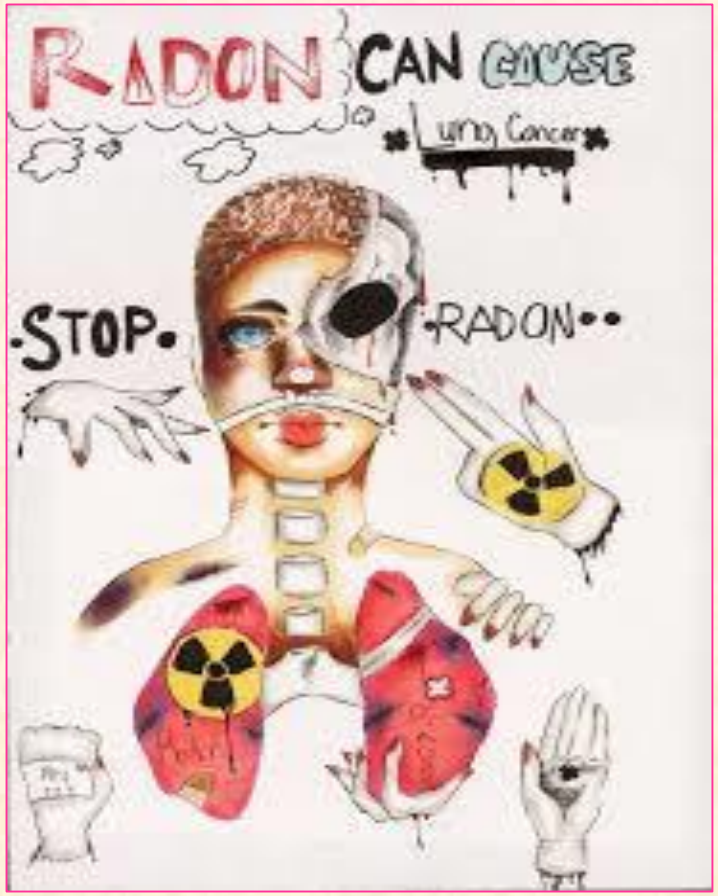
Is your home safe?



Is your home safe? Study this wonderful image on home radon. Go to: www.radonisreal.org to download a full-size of this image, and study it closely.

Proper home inspections

1. A person can test their home by purchasing a home testing kit at a hardware store for about $20.
2. The better option is to hire a qualified professional specifically trained to carry out a radon inspection/test, as well as fix elevated levels of radon.
3. To find a qualified professional, contact your State Radon Office.



Module 1

The science of radon

Radon is classified by International Agency for Research on Cancer (IARC) as Group 1, carcinogenic to humans, with a well-established link to lung cancer. The 2012 IARC review of Group 1 carcinogens reaffirmed this classification. Several epidemiological studies show a causal relationship between occupational exposure to radon gas at high doses and an increased incidence of lung cancer.

Module 1

The danger of concurrent exposure

Concurrent exposure to radon and cigarette smoke has a synergistic effect on the development of lung cancer. Using results from a 2012 residential radon survey of homes across the country, Health Canada estimated that 16% of lung cancer deaths (more than 3,200 cases/year) are attributable to radon exposure.

Radon and cancer

There is conclusive evidence that radon also is one of the leading environmental causes of lung cancer mortality in the general population. The evidence for radon carcinogenicity is consistent among different study types and populations.

Get educated!

- Radon educational materials are available at **www.radonleaders.org**, an EPA-supported website.
- Additional information is available from radon offices operated by the Department of Public Health in most states. Use the EPA's search tool at www.epa.gov/radon or call the **National Radon Hotline at 1–800–767–7236.**
- Free educational fliers and brochures to prompt discussion between health care providers and patients, as well as educational videos **www.canceriowa.org/breathingeasier.**

Overview on Radon Gas

Thank-you for joining us. And, now you can proceed to the quiz/final review which consists of ten multiple choice questions. Good luck!

The End of Module 1