



## Activity 2: Radiation and Uranium Myths and Facts

### Objectives

Students will:

- Explore their views of radiation and uranium.
- Assess their knowledge of radiation and uranium.
- Examine and correct any radiation and uranium misconceptions they may have.

### Next Generation Science Standards

The concepts in this activity can be used to support the following science standards:

- PS1. Structure and Properties of Matter.
- PS4. Waves and Electromagnetic Radiation.
- ESS3. Earth and Human Activity.

### Materials and Resources

- *Uranium: Teacher Background Information.*
- *Vocabulary Materials.*
- *Uranium Myths and Facts Quiz* (one per student, pair or group) and *Uranium Myths and Facts Teacher Answer Key.*
- *Uranium Views Worksheet* (optional; one per student, pair or group).
- Board or computer and/or projector for listing students' responses (optional for step 2).

### Time

45-60 minutes, not including optional activities or extensions.

### Vocabulary

- Atom
- Alpha particle
- Beta particle
- Gamma rays
- Ionizing radiation
- Nuclear energy
- Radiation
- Radioactive atom
- Radioactive decay
- Radiation exposure
- Radon
- Uranium
- Uranium mining
- Uranium milling

## Directions

1. Start with a vocabulary activity if students are not familiar with uranium and the vocabulary used in this activity.
2. Ask students to share what they know about radiation, radioactive elements like uranium, and radiation exposure. List their responses for all to see.
3. Review the list and ask the class to decide whether each is a fact or myth. If students have not previously done so, ask them to provide examples of myths (such as radiation exposure will make you glow).
4. Explain that we may receive misinformation from various sources (like movies, comics, video games, other media sources and people) and perceive it to be true when in fact it is not.
5. Explain to the students that they will be completing a myths or facts quiz. The quiz is not to be graded but is a fun way to determine what students know about uranium. Let them know that it's okay if they don't know the answers to the quiz. It's meant to be a learning tool. Distribute, and direct students to complete, the *Uranium Myths and Facts Quiz*.
6. Conclude by reviewing the correct responses using the *Uranium Myths and Facts Teacher Answer Key*. Determine what the greatest misconceptions were for the class based on incorrect responses. Discuss how this activity has changed or confirmed students thinking about radiation. Explain that an important part of science and gaining knowledge is to investigate and verify information with reliable resources.
7. Optional activities or extensions:
  - Have students share the *Uranium Myths and Facts Quiz* (or create another quiz or survey to share) with community members, siblings or parents. Analyze the responses and determine how educated community members are about uranium-related radiation.
  - Direct students to complete the *Uranium Views Worksheet* by talking with friends, family and community members. Answers from students will vary.
  - Select all or several events from the *Highlights in Uranium History* (see the *Uranium: Teacher Background Information*) and print each event on a separate sheet of paper. Options include printing the dates with the event, having students research the event to determine the date or range of dates, or providing the dates after students form predictions about when the events occurred. Provide students with an event and direct them to create a timeline by lining up in the order in which the events occurred. Review and confirm the correct order of events. Discuss how these events have potentially led to myths that exist today and how these events have also led to us learning facts about uranium and radiation.
  - Have students create public messages that educate the public and address misinformation and misconceptions. Ideas may include brochures, posters, cartoons, videos or radio announcements, raps, poems and articles. These materials could be shared within the school and community.

# Uranium Myths and Facts Quiz

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Read each statement. Mark whether each statement is “True” or “False” depending on what you think or believe to be correct.

- 
- True**     **False**    1. Uranium is a man-made element.
- 
- True**     **False**    2. Uranium (U) is a silvery-white, weakly radioactive metal in the actinide series of the periodic table.
- 
- True**     **False**    3. Uranium atoms are unstable and decay (forming other elements like radium and radon) until they become stable lead atoms.
- 
- True**     **False**    4. Uranium decays at a quick rate.
- 
- True**     **False**    5. Any amount of uranium exposure will cause you to develop cancer.
- 
- True**     **False**    6. Waste from uranium mining and milling remains radioactive forever.
- 
- True**     **False**    7. Most of the radiation that we are exposed to is man-made.
- 
- True**     **False**    8. Uranium gives off radiation (alpha particles, beta particles and gamma rays) as it decays.
- 
- True**     **False**    9. Gamma rays produce short wavelengths at a high frequency and can penetrate the body and damage living tissue.
- 
- True**     **False**    10. People are more at risk from radon exposure in their home than living near a nuclear power plant.
- 
- True**     **False**    11. Uranium was discovered during World War II when the atomic bomb was developed.
- 
- True**     **False**    12. Radioactive mining and milling waste can get into our food, water and air supplies.
- 
- True**     **False**    13. I can reduce my risk of uranium exposure by using time, distance and shielding protection measures.
- 
- True**     **False**    14. Children and adults are equally sensitive to radiation exposure.
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## Uranium Myths and Facts Teacher Answer Key

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- |                               |   |  |
|-------------------------------|---|--|
| <input type="checkbox"/> True | <input checked="" type="checkbox"/> False | 1. Uranium is a man-made element.<br><b>Uranium is a naturally occurring element found in rock, soil, water, air and our bodies.</b> |
|-------------------------------|---|--|
- 
- |  |                                |  |
|--|--------------------------------|--|
| <input checked="" type="checkbox"/> True | <input type="checkbox"/> False | 2. Uranium (U) is a silvery-white, weakly radioactive metal in the actinide series of the periodic table.<br><b>Uranium (U) is a heavy metal with an atomic number of 92 and atomic weight of 238. It serves as an energy source because it is radioactive and gives off radiation that can be used for many purposes.</b> |
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- |  |                                |  |
|--|--------------------------------|--|
| <input checked="" type="checkbox"/> True | <input type="checkbox"/> False | 3. Uranium atoms are unstable and decay (forming other elements like radium and radon) until they become stable lead atoms.<br><b>Radioactive atoms emit energy waves (photons) or high speed particles. This process is known as radioactive decay.</b> |
|--|--------------------------------|--|
- 
- |                               |   |   |
|-------------------------------|---|---|
| <input type="checkbox"/> True | <input checked="" type="checkbox"/> False | 4. Uranium decays at a quick rate.<br><b>Uranium decays at a slow rate. The decay process can take billions of years.</b> |
|-------------------------------|---|---|
- 
- |                               |   |   |
|-------------------------------|---|---|
| <input type="checkbox"/> True | <input checked="" type="checkbox"/> False | 5. Any amount of uranium exposure will cause you to develop cancer.<br><b>The amount of damage depends on the type of radiation, its energy and the total amount of radiation absorbed. Also, some human cells are more sensitive to radiation.</b> |
|-------------------------------|---|---|
- 
- |                               |   |  |
|-------------------------------|---|--|
| <input type="checkbox"/> True | <input checked="" type="checkbox"/> False | 6. Waste from uranium mining and milling remains radioactive forever.<br><b>The radioactivity of the waste reduces with time. However, it can take many thousands of years before some of these materials no longer pose a risk.</b> |
|-------------------------------|---|--|
- 
- |                               |   |   |
|-------------------------------|---|---|
| <input type="checkbox"/> True | <input checked="" type="checkbox"/> False | 7. Most of the radiation that we are exposed to is man-made.<br><b>Generally, half of our exposure to radiation comes from man-made sources and half from natural (background) radiation. The largest source of man-made radiation is medical exposure.</b> |
|-------------------------------|---|---|
- 
- |  |                                |   |
|--|--------------------------------|---|
| <input checked="" type="checkbox"/> True | <input type="checkbox"/> False | 8. Uranium gives off radiation (alpha particles, beta particles and gamma rays) as it decays.<br><b>As uranium decays and forms other elements, some atoms (like uranium-238, radium-226 and polonium-210) emit alpha particles (positively charged; made of two protons and two neutrons) from the atom's nucleus. Most isotopes decay by a combination of alpha particles, beta particles and gamma rays.</b> |
|--|--------------------------------|---|
- 
- |  |                                |  |
|--|--------------------------------|--|
| <input checked="" type="checkbox"/> True | <input type="checkbox"/> False | 9. Gamma rays produce short wavelengths at a high frequency and can penetrate the body and damage living tissue.<br><b>Radiation is energy that travels in the form of waves or high speed particles. Gamma rays produce ionizing radiation found at the short wavelength, high frequency end of the electromagnetic spectrum. The high energy of gamma rays can penetrate the body like x-rays and damage tissue and DNA.</b> |
|--|--------------------------------|--|
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- True**     **False**    10. People are more at risk from radon exposure in their home than living near a nuclear power plant.  
**Radon exposure accounts for 37 percent of our annual exposure to radiation, and living in a home or area with high radon levels can be very harmful to your health. Radon can be an issue in any region and living near a nuclear power plant does not make you more or less likely to have a high level of radon in your home or school. Nuclear power plants implement many radiation protection measures to limit your exposure to radiation. Therefore, living near a power plant barely increases your overall radiation exposure.**
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- True**     **False**    11. Uranium was discovered during World War II when the atomic bomb was developed.  
**Radiation is all around us and has been present since the birth of this planet. Martin Klaproth, a German chemist, discovered uranium in 1789. However, the demand for and recognition of, uranium increased after World War II.**
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- True**     **False**    12. Radioactive mining and milling waste can get into our food, water and air supplies.  
**Radioactive waste that is not cleaned up or properly stored can get into food, water and air supplies. This increases the risk of inhaling, ingesting or experiencing direct exposure to radiation.**
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- True**     **False**    13. I can reduce my risk of uranium exposure by using time, distance and shielding protection measures.  
**Basic radiation protection concepts (time, distance and shielding) can be applied separately or in combination to help limit people's exposure to increased radiation levels.**
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- True**     **False**    14. Children and adults are equally sensitive to radiation exposure.  
**Children are in the process of growing. There are more cells dividing and a greater opportunity for radiation to disrupt the growth process. Recent U.S. Environmental Protection Agency (EPA) radiation protection standards take into account differences in sensitivity due to age.**
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# Uranium Views Worksheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Answer the following questions.

1. My community views uranium and radiation as:

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2. What misconceptions did I (and my community) have about uranium and radiation?

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3. What led to these misconceptions about uranium and radiation?

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4. Explain how my views of uranium and uranium mining changed from this activity or why have they not changed?

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