MythBustin': Realities of Radiation

ENGAGE

Myth #1:

You are naturally radioactive.

CONFIRMED OR BUSTED?!?

You decide!

MythBustin': Realities of Radiation

ENGAGE

Myth #2:

Radiation is used to control mosquito populations and hinder disease.

CONFIRMED OR BUSTED?!?

You decide!

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Myth #3:

You are exposed to low levels of radiation when you fly.

CONFIRMED OR BUSTED?!?

You decide!

Confirmed? Or Busted?

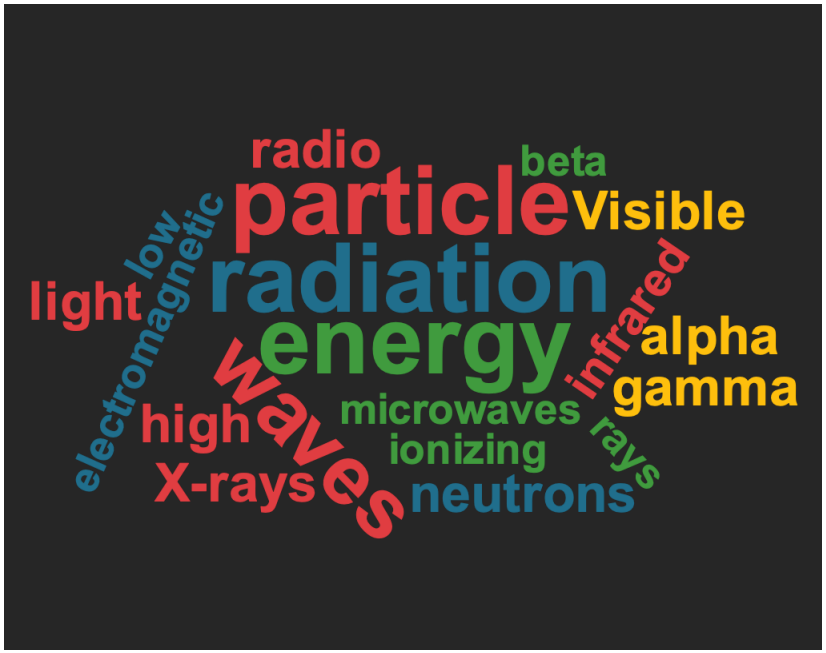
What evidence did you use to determine if each myth was confirmed or busted?

Vote **CONFIRMED** or **BUSTED** for each myth. Make sure you can support your answer with evidence!

- What did you learn about radiation that you didn't know before?
- Do you think that radiation is something that people should fear?

How do these terms relate?

LEARN



In the next activity you will study the various types of radiation by conducting research.

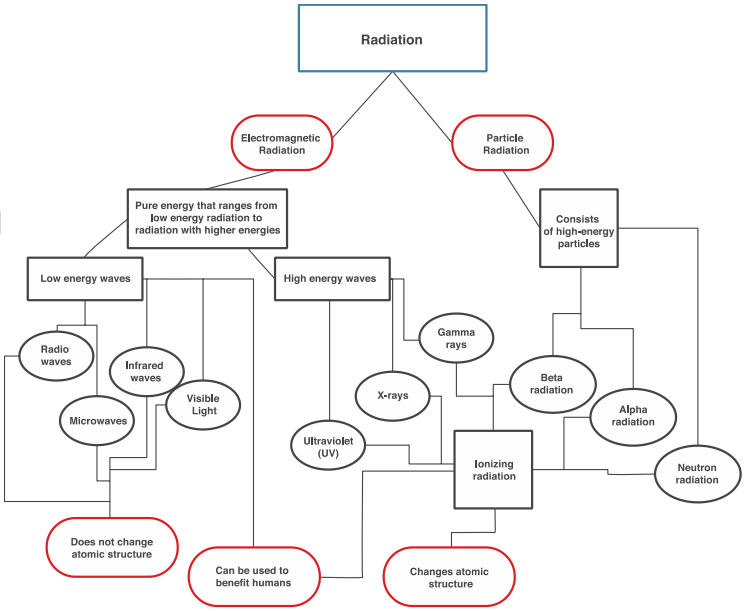
- Which of the terms in the image have you heard of before?
- How do you think these terms relate to one another?

Radiation Concept Map

Each group should get a copy of the Radiation Concept Map Notes Sheet, a card set, string, and scissors.

Your task is to organize and connect the terms (using string) to create a concept map that shows how the various types of radiation relate to one another.

You should begin by doing research and filling out the notes sheet.

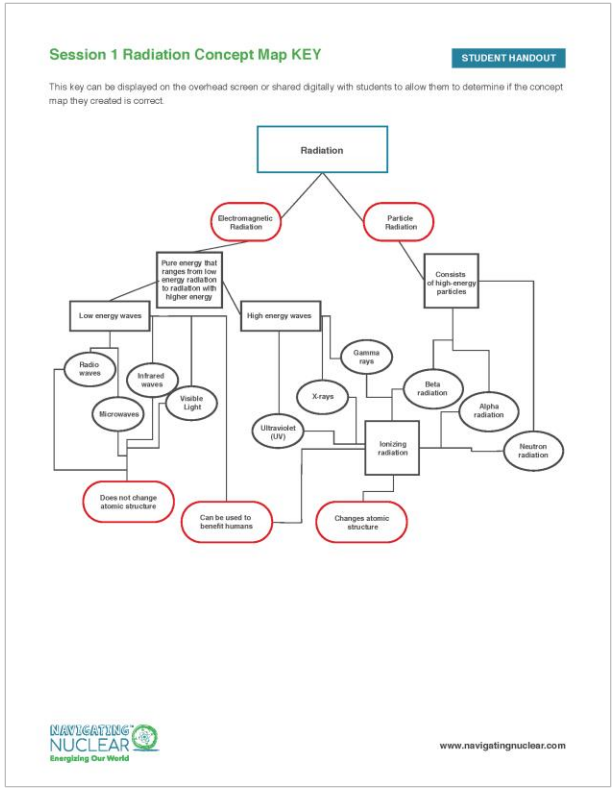


Sources to get you started:

Radiation Basics
https://www.nrc.gov/about-nrc/radiation/health-effects/radiation-basics.html

Introduction to the Electromagnetic Spectrum
https://science.nasa.gov/ems/01_intro

Radiation Concept Map: Key

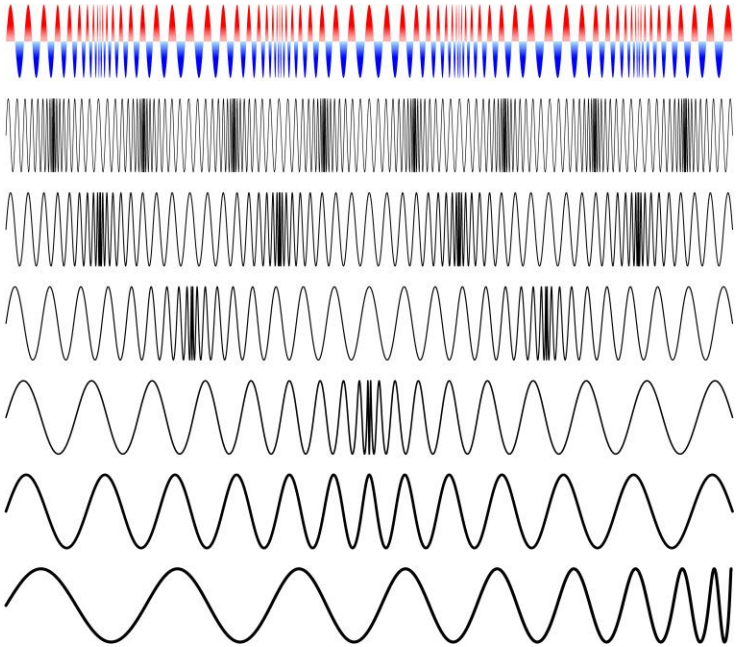


How did you do on the concept map?

What makes the various types of radiation different from each other?

Would you add any other headings to this concept map to group the types of radiation?

Session 1 Summary



Now that you have learned the basics about radiation, can you…

- ✓ Define radiation.
- ✓ Compare and contrast two major types of radiation: ionizing and non-ionizing.
- ✓ Discuss how various types of radiation can affect human health.

What is an atom and why does it emit radiation?

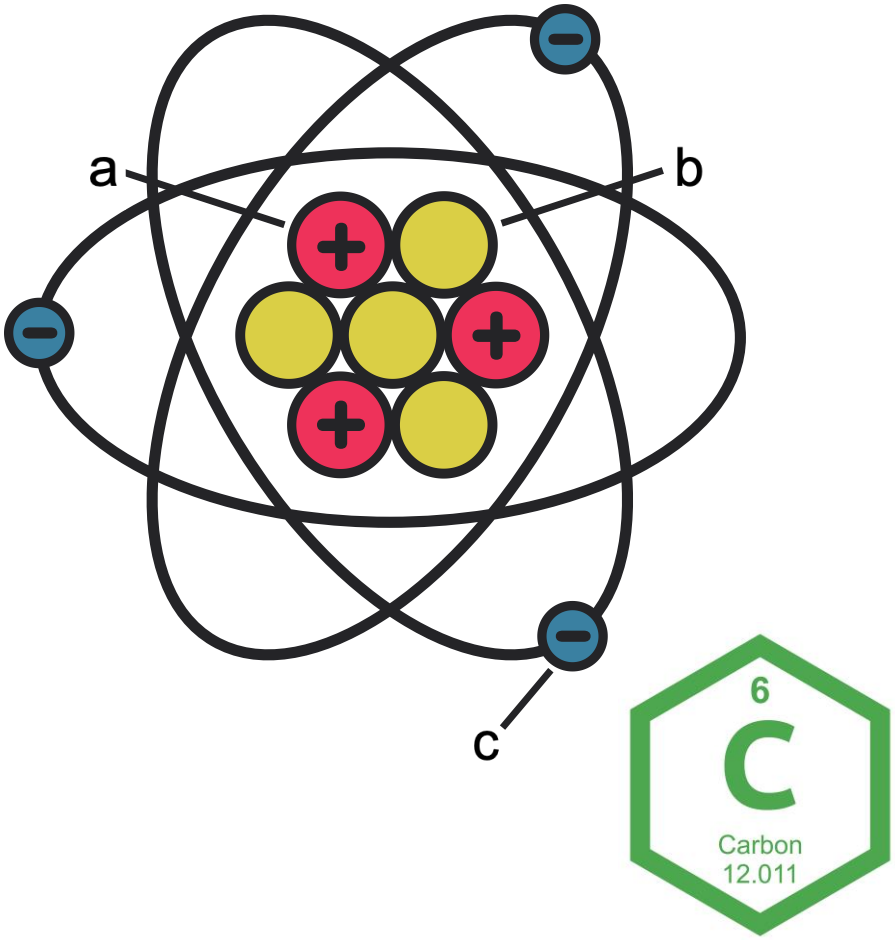
EXPLAIN

Now that you know the basics about radiation, let's take a closer look at **IONIZING RADIATION!**

But let's start with a quick review on atoms and the periodic table…

Can you identify the parts of an atom?

What does the periodic table tell us about carbon?



NAVIGATING NUCLEAR
Energizing Our World

Feeling a little unstable, atoms???

Each student should get a copy of the Radioactive Decay Notes Capture Sheet.

As you watch the video, fill in the notes sheet.

THINK:

What happens when the nucleus of an atom becomes unstable?
Why do atoms react differently?

Need more practice with atoms?
Virtually build atoms at:
https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html

Balancing Nuclear Equations

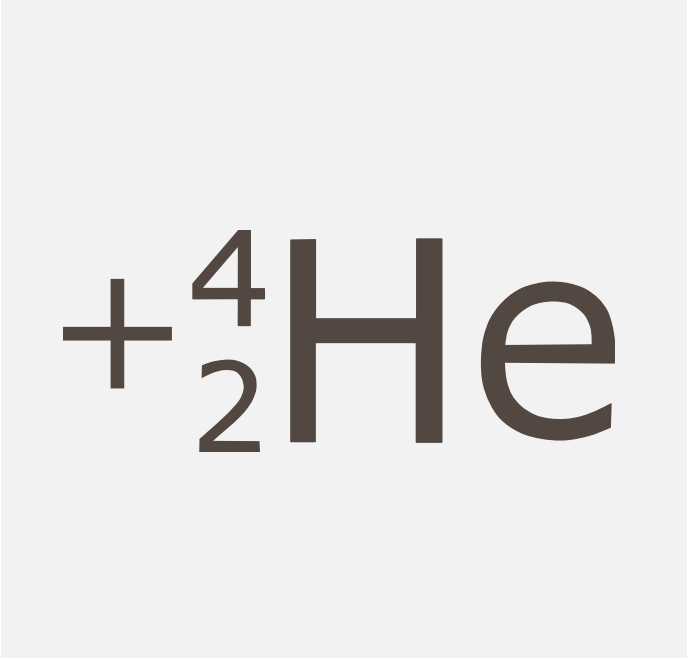
Now it is time to complete **PART 2** of your notes sheet.

The image shows alpha decay of the nucleus that results in the release of a helium nucleus.

The number on top represents the atomic mass of the alpha particle, and the number on bottom represents the atomic number.

Open the virtual periodic table on your laptop or iPad and go to https://ptable.com for a virtual periodic table.

Use this and your notes to help you balance the six nuclear equations!



Balancing Nuclear Equations!

How many answers did you get correct?

Alpha Decay

$$^{224}_{88}Ra \rightarrow {}^{220}_{86}Rn + {}^{4}_{2}He$$

$$^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$$

$$^{210}_{84}Po \rightarrow {}^{206}_{82}Pb + {}^{4}_{2}He$$

Beta Decay

$$^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}e$$

$$^{234}_{90}Th \rightarrow {}^{234}_{91}Pa + {}^{0}_{-1}e$$

$$^{210}_{82}Pb \rightarrow {}^{210}_{83}Bi + {}^{0}_{-1}e$$

Determining the half-life of a fictional radioactive isotope

ACTIVITY

For this activity you will need to form small groups of 3.

Each group needs the following materials:

- 1 cup
- 50 pennies
- 50 dimes
- A copy of the "Determining the Half-Life of a Radioactive Isotope Data" sheet

Read through the instructions on the sheet and record your data in the data table.

You should construct a graph when you are finished and follow the instructions to determine and indicate the half-life of their penny atoms on the graph.

NAVIGATING NUCLEAR
Energizing Our World

So how can we use the half-lives of elements?

In the next session, you will be looking at other ways that radiation can be used to help improve the lives of people or solve global problems!

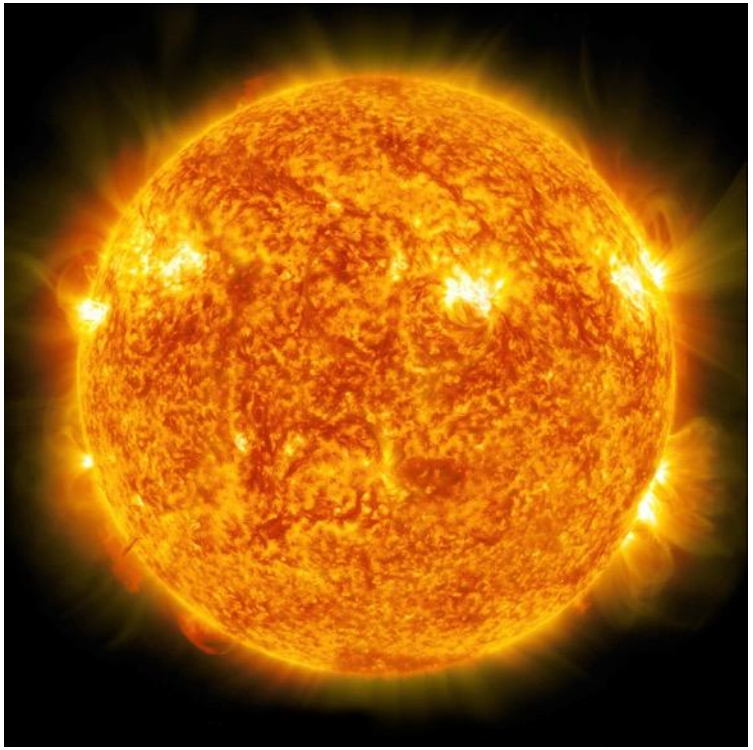
Session 2 Summary

Reflect on the importance of understanding ionizing radiation:

- What information have we gained from determining the half-lives of radioactive isotopes?
- How can this knowledge guide us in using radiation?

Remember:

Ionizing radiation may seem concerning at first glance but understanding this high-energy radiation has led to the discovery and creation of many techniques and tools that we use and depend on.



Using Radiation for Good: Radiation Innovations

CHALLENGE

GOAL: To research and brainstorm ways to improve how ionizing radiation and nuclear techniques are used to help solve global problems.

1. Get with a partner or small group.
2. Research area in which ionizing radiation is used.
3. Create an innovative and unique product (or a product that improves on one that already exists) that uses radiation to help to solve a problem.
4. Present a prototype model and explain how this product will theoretically work or improve an existing product!

Examples of fields that use the power of radiation

- **Agriculture**—Food irradiation
- **Agriculture**—Crop pest sterilization (SIT—Sterile Insect Technique)
- **Agriculture**—Using nuclear science to trace nitrogen in soil and crops
- **Medical**—Radiation therapy for cancer
- **Medical**—Radiation in x-rays and scans
- **Medical**—Radiopharmaceuticals
- **Global Health**—Mosquito sterilization (SIT—Sterile Insect Technique)
- **Genetics**—Gamma irradiation to improve and create plant species
- **Environmental Science**—Using nuclear science to trace microplastics in ocean life
- **Environmental Science**—Using nuclear science to understand drought

Now that you have your topic it's time to …

- Do research (use the sheet to guide you!)
- Create a model (2-D or 3-D!)
- Prepare your presentation (using PowerPoint or Google slides!)

Radiations Innovations Challenge

Let the presentations begin!

Audience: Be prepared to ask questions or give feedback after each group concludes their presentation.

It's time to test your knowledge of radiation!

REFLECT

Form teams of 3–4 and get a white board and dry erase marker for your team!

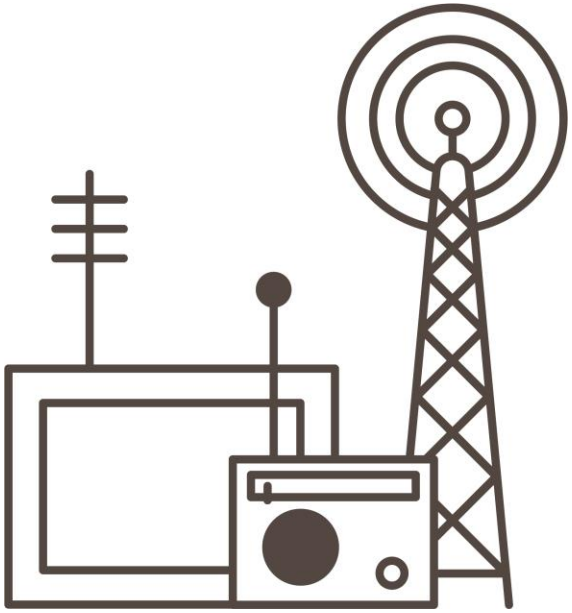
In the next slides, you will be given a series of questions and your job is to connect the question to the particular type of radiation.

In the time given, your team must write your answer on the white board and hold it up when time is called!

Each correctly answered question gets your team a radiation card. The team with the most cards at the end of the game WINS!

Question 1

These are considered to be one of humanity's most important discoveries as they make communication much more efficient.

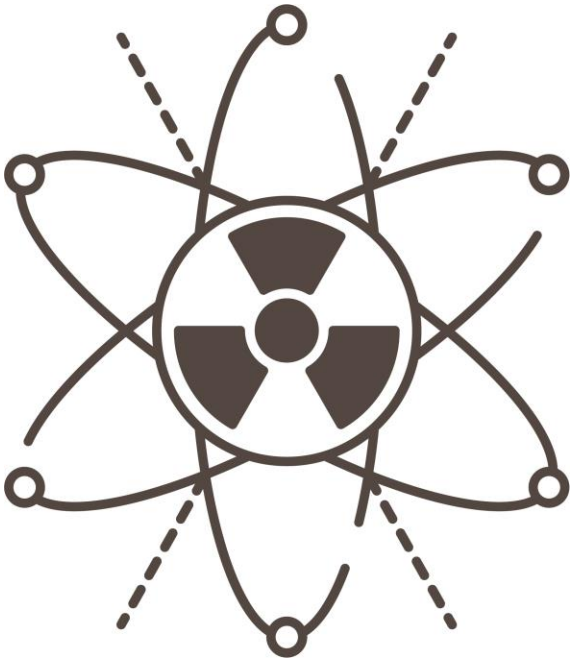


Answer:

RADIO WAVES!

Question 2

These have the smallest wavelengths and the most energy of any other **wave** in the electromagnetic spectrum.

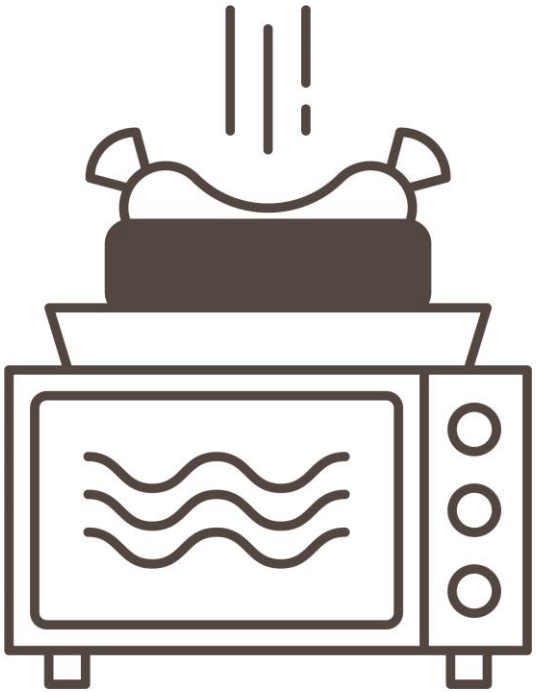


Answer:

GAMMA WAVES!

Question 3

NASA and other space agencies use these for deep space communication.

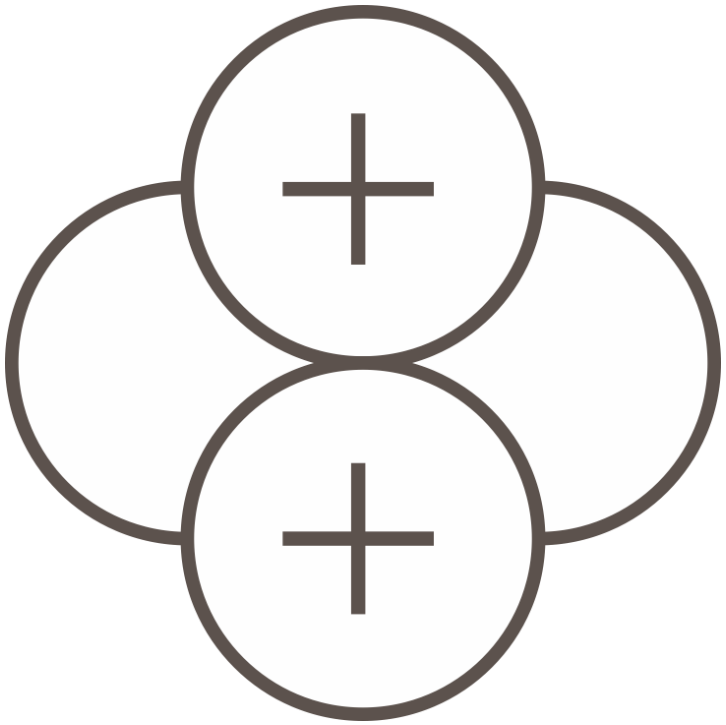


Answer:

MICROWAVES!

Question 4

This form of radiation is actually a helium nucleus.

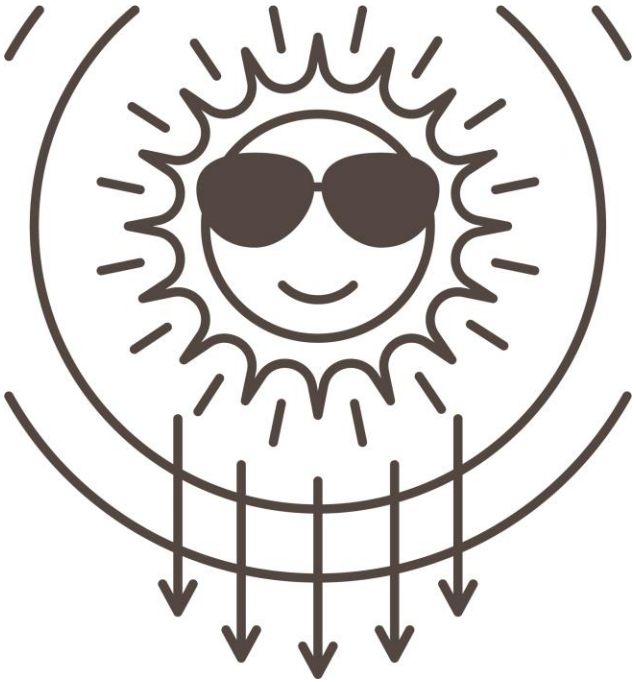


Answer:

ALPHA RADIATION!

Question 5

This type of radiation lies in the invisible spectrum which gives it the name ‘black light.’

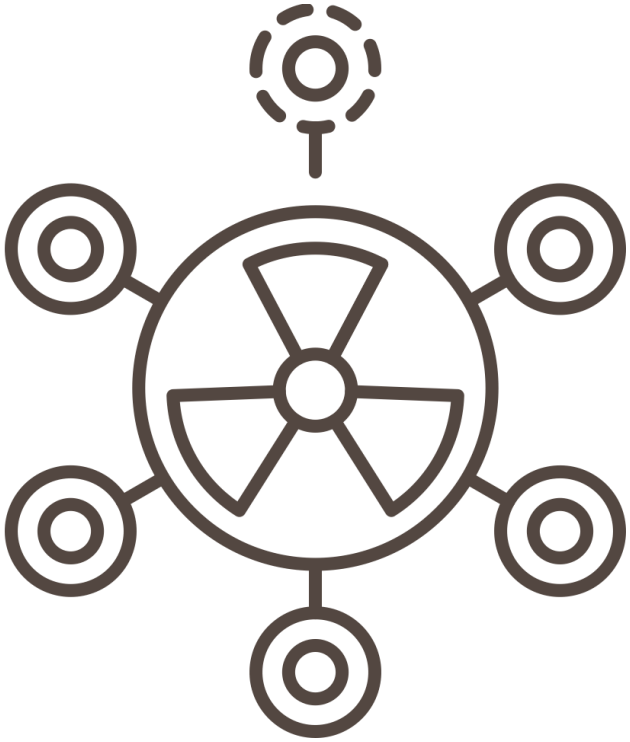


Answer:

ULTRAVIOLET RADIATION (UV)!

Question 6

This is the only form of radiation that can make other objects radioactive.

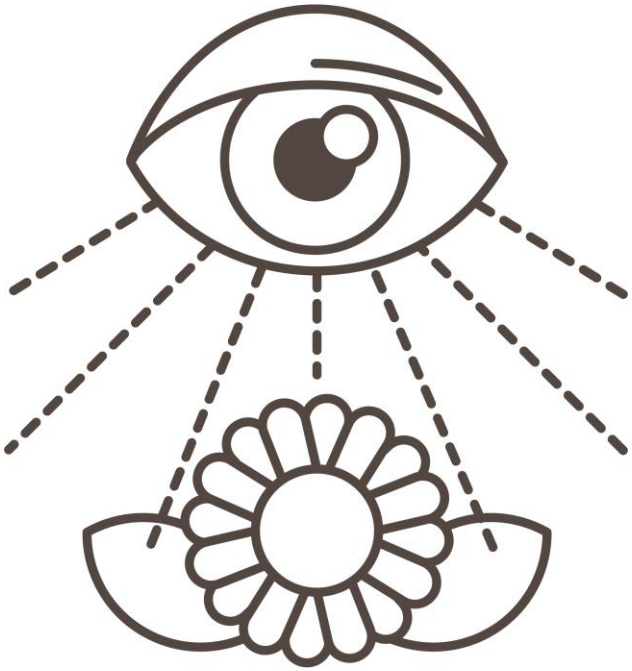


Answer:

NEUTRON RADIATION!

Question 7

We only see color because our eyes can detect the reflection of this type of radiation off of objects.

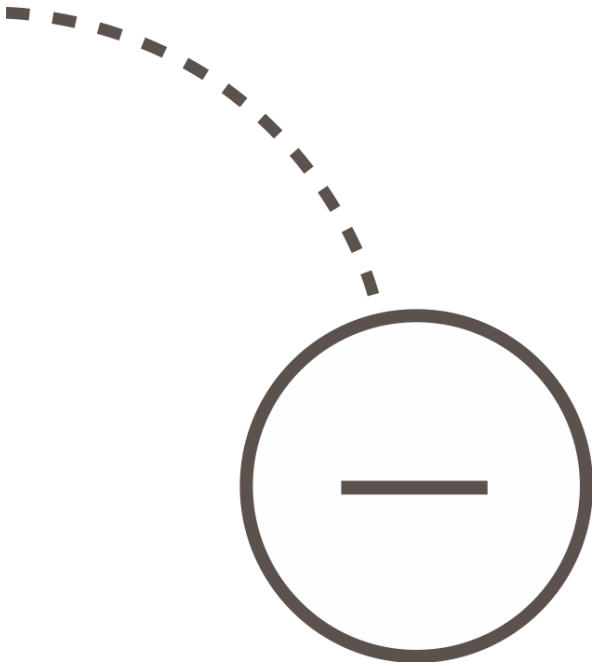


Answer:

VISIBLE LIGHT!

Question 8

When this type of radiation is emitted from a nucleus, a neutron actually turns into a proton.

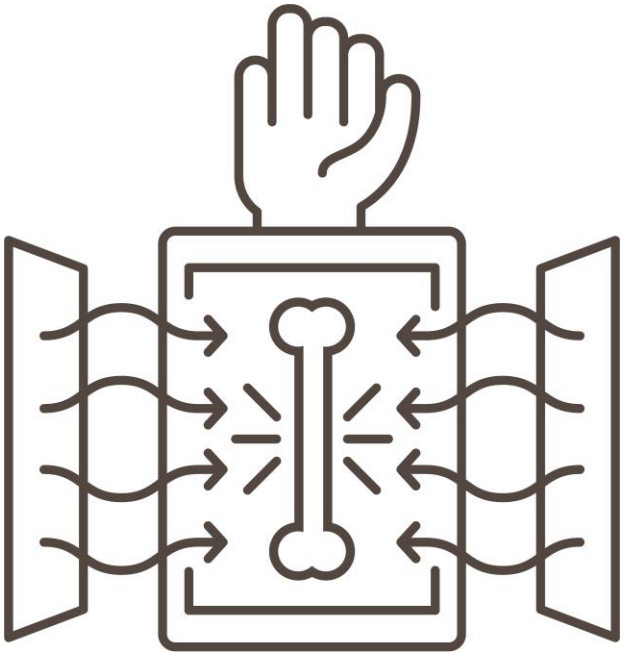


Answer:

BETA RADIATION!

Question 9

This type of radiation got its name because the man who discovered it in 1895 didn't know what it was!

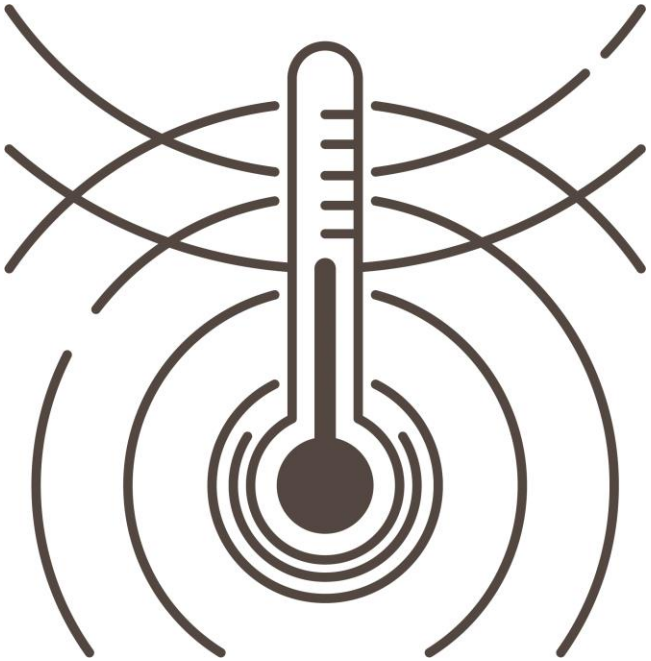


Answer:

X-RAYS!

Question 10

Some snakes have special sensory pits that are used to “see” this type of radiation and detect warm-blooded prey.



Answer:

INFRARED RADIATION!

Has anyone collected the full spectrum of radiation?

Who will be the winner of the radiation trivia challenge?

The team that has collected the most cards will be declared the winner! Thanks for playing!