Electromagnetic War

Background

The "Electromagnetic Spectrum" is just a fancy phrase we use to describe *light*. All the colors of the rainbow are different colors of light, i.e. they have different frequencies, but there are many more frequencies of light that your eyes cannot see. You may be familiar with some of these. (Show and/or pass out the EM spectrum graphic and go over the different types from low energy / long wavelength to high energy / short wavelength). Objects in space emit all of these types of light, and astronomers use different types of telescopes to catch each kind – to peer into the *invisible* side of the universe.
Gamma Rays –the highest energy and shortest wavelength. Gamma rays have so much energy that they are harmful to humans. Fortunately for our safety, our atmosphere blocks the gamma rays coming from space, but gamma rays are also sometimes created on Earth, such as in atomic bomb explosions. To study gamma rays, we have to put gamma ray telescopes in space!

X-Rays – x-rays are not quite as energetic as gamma rays, but we still want to protect ourselves from them. They are powerful enough to go through your body, but not powerful enough to go through your bones. You have to wear a lead vest when you get an x-ray from the doctor.

UV Rays – These are still slightly harmful to humans – they cause sunburn! You have to wear sunscreen to protect yourself from UV Rays.

Visible Light – All the colors of the rainbow are just a tiny portion of the whole EM spectrum. Most of the universe glows in invisible light!

Infrared – This light is created by heat. Your body glows in infrared light, so we use infrared light for night vision cameras.

Radio waves – These are the longest wavelength, least energetic type of light. They generally glide through the atmosphere, over hills, and around buildings with ease. Your TV and cell phone use radio waves to send and receive signals. The National Radio Astronomy Observatory, with the largest fully steerable telescope in the world is located in Green Bank, West Virginia!

The Robert C. Byrd Green Bank Telescope (GBT) in Green Bank, West Virginia.

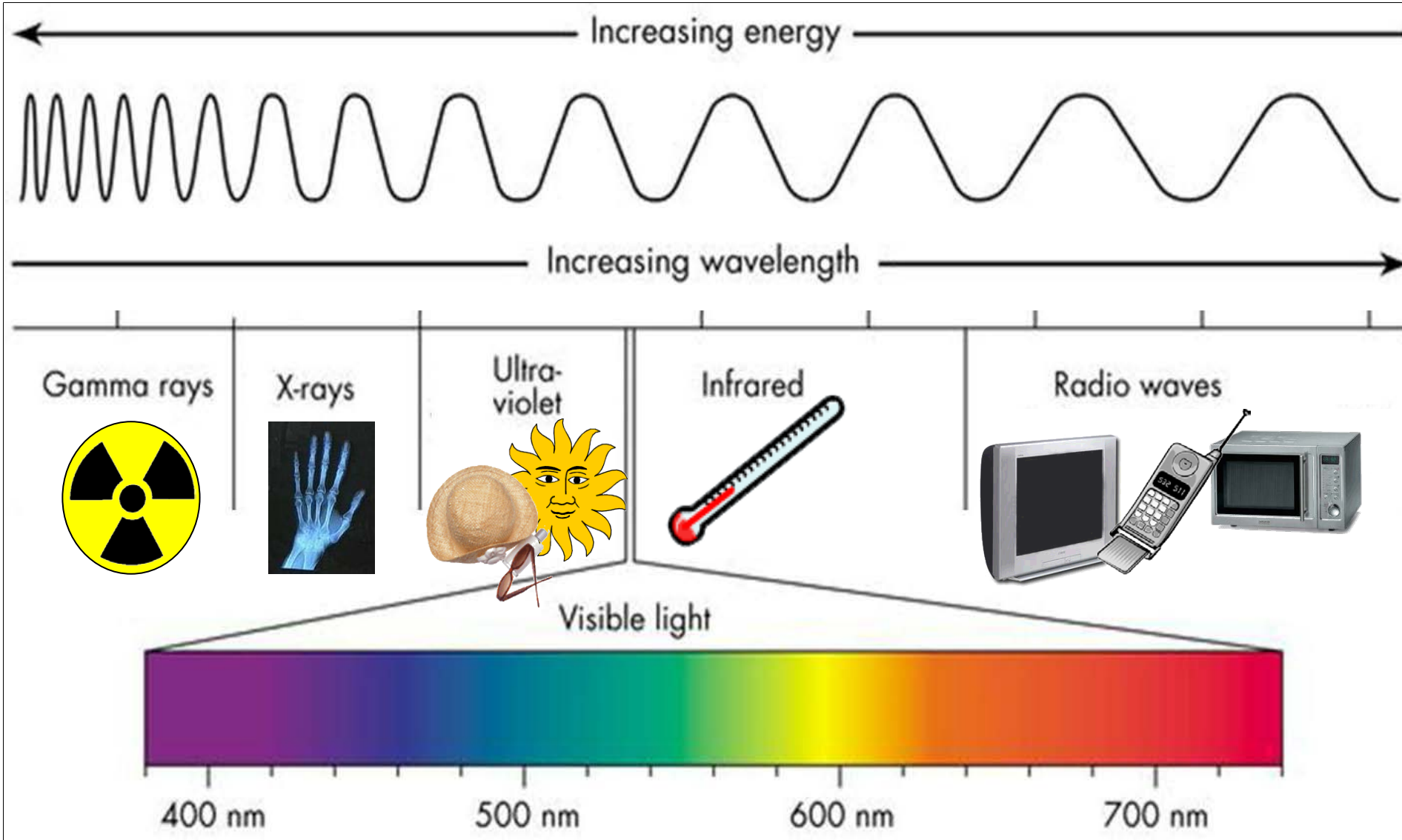
Activity

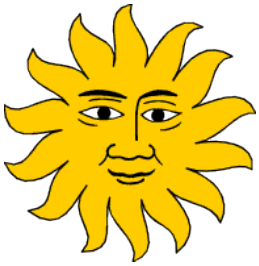
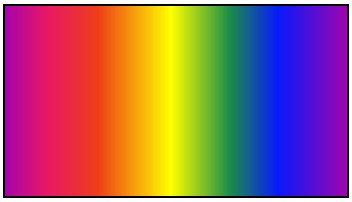
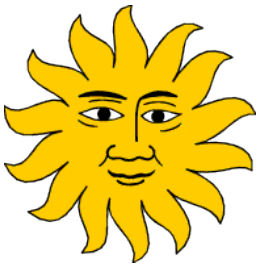
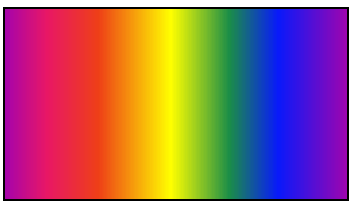
This card game is played just like the regular card game War, but instead of a higher number winning, the electromagnetic light with the longest wavelength wins. The object of the game is to get all of the cards.
Print enough copies of the EM Spectrum graphic so each student can see it, or project it on the wall. Print and cut out the EM War cards. Give each student 10 cards.

- Students play in pairs
- Keep cards face town
- Each student in the pair flips over a card at the same time.
- The card with the longest wavelength wins.
- The winner takes both cards and adds them to their pile.
- Repeat until one student has all the cards.
- Note: If both students flip the same card, they need to go to "war" – they lay down another card. Whoever wins this war takes all *four* cards.

Optional for a large group: Give each student only one card and have students play one round with their neighbor.

This activity was adapted from the Montana Space Grant Consortium's Space Public Outreach Team.


Increasing energy
Increasing wavelength
Gamma rays
X-rays
Ultra-violet
Infrared
Radio waves
Visible light
400 nm
500 nm
600 nm
700 nm

X-Rays 	**Ultraviolet** 	**Microwaves** 	**Gamma Rays** 
Visible Light 	**Radio** 	**Infrared** 	**Television** 
X-Rays 	**Ultraviolet** 	**Microwaves** 	**Gamma Rays** 
Visible Light 	**Radio** 	**Infrared** 	**Television** 

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