

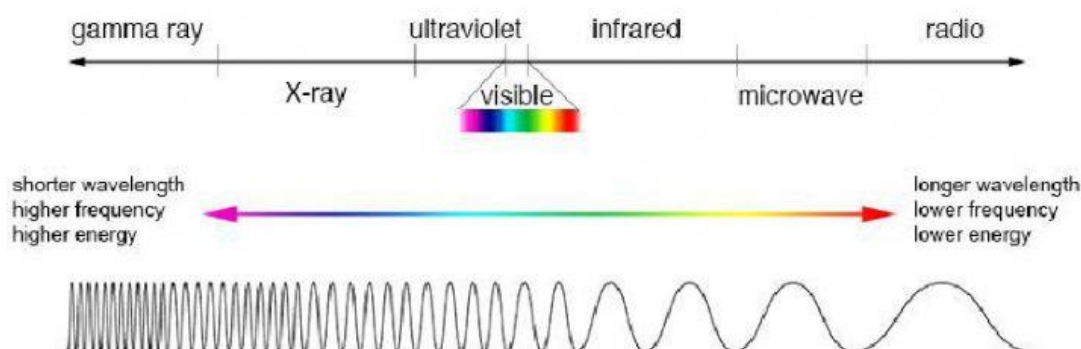
PHYSICS: Light and Optics

Activity: PHET Molecules and Light

Open a web browser and go to: PHET Molecules and Light

https://phet.colorado.edu/sims/html/molecules-and-light/latest/molecules-and-light_en.html

Electromagnetic radiation (EMR) is light. There are seven classes of electromagnetic radiation in the electromagnetic spectrum: Gamma, X-ray, Ultraviolet, Visible, Infrared, Microwave, & Radio. Gamma rays are the most energetic with the highest frequency. In contrast, radio waves have the least energy with the lowest frequency.



Because of differences in the frequency and energy of the light waves, different forms of light interact differently with different types of matter. This activity will explore how different forms of electromagnetic radiation (light) with different amounts of energy, when passed as a beam through clouds of gasses, interact with different gases.

IONIZATION	The light wave breaks chemical bonds. The energy of the photon breaks the molecule into atoms that move separately.
EXCITATION/ EMISSION	The light wave is absorbed by the gas molecule, giving the gas molecule extra energy (excited). The gas molecule glows. Then, the molecule releases that extra energy as different light wave.
ROTATION	The light wave causes the molecule to spin. The molecule releases energy in the form of a different light wave, stopping the rotation.
VIBRATION	The light wave causes the atoms of the molecule to vibrate (wiggle) at their chemical bonds. The molecule releases the energy in the form of a different light wave, stopping the vibration.
NOTHING	No interaction. The light wave does not disturb or change the molecule.

Name: _____ Date: _____

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Instructions

1. Write the number of atoms that make up the molecule in the first column.
2. Point the light beam at the molecules.
3. Turn on the light beam to the fastest setting.
4. Place the molecules of the different gases in front of the light beam.
5. Observe what happens to the molecules at the light beam interacts with the molecules.
6. Identify the interaction between the beam of light and the gas molecule. Write that interaction in the data table.

Data Table

		Beams of Light			
GAS	Number of atoms?	Microwave	Infrared	Visible	Ultraviolet
Carbon Monoxide					
Nitrogen gas					
Oxygen gas					
Carbon Dioxide					
Methane					
Water vapor					
Nitrogen dioxide					
Ozone gas					

Which interactions happened with which class of EMR?

Beam of Light	2 atoms in a molecule	3 atoms in a molecule	4 or 5 atoms in a molecule
Microwave			
Infrared			
Visible			
Ultraviolet			

Based on your observations, answer the following questions.

What happens to make things “glow in the dark”?	
How do microwave ovens heat up food and water?	
How do greenhouse gases trap infrared light?	
How does the ozone layer protect the surface of the Earth?	