



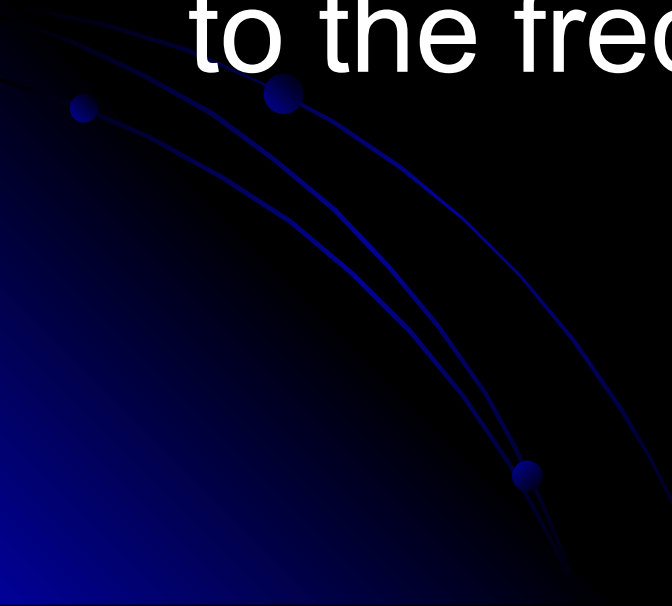
Nature of Light

Unit 5 cont.

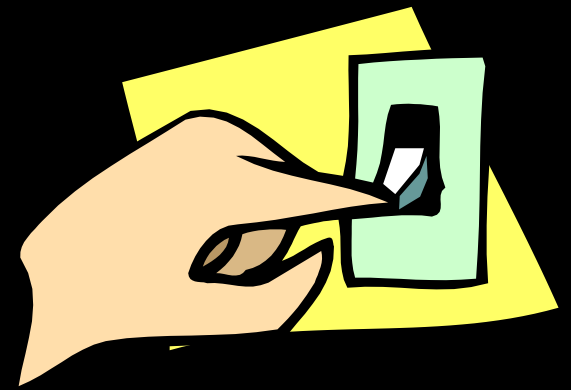
Dual Nature of light

- Light can be modeled as a stream of particles.
- The particles of light are called photons.
- Light can also behave as a wave.
- The best explanation of light is that it is particles that travel in waves.

Energy - frequency

- Light is a form of energy
(photons – energy particles)
 - Energy is directly proportional
to the frequency of light.
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Speed of Light




- All electromagnetic waves in empty space travel at the same speed.
- The speed of light is 3×10^8 m/s
 - 300,000,000 m/s
 - or 186,000 miles per second
- The speed of light is constant.
- Light is the fastest signal in the universe

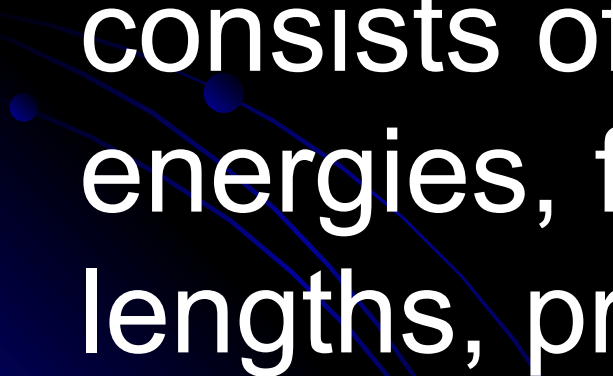


- Light travels slower in a medium than in vacuum.
- Light (electromagnetic radiation) travels FASTEST in space
- Light travels slower in liquid than in air

Brightness - Intensity

- Intensity depends on the # of photons or waves of light that pass certain area of space.
 - The greater the distance from the source the dimmer the light.
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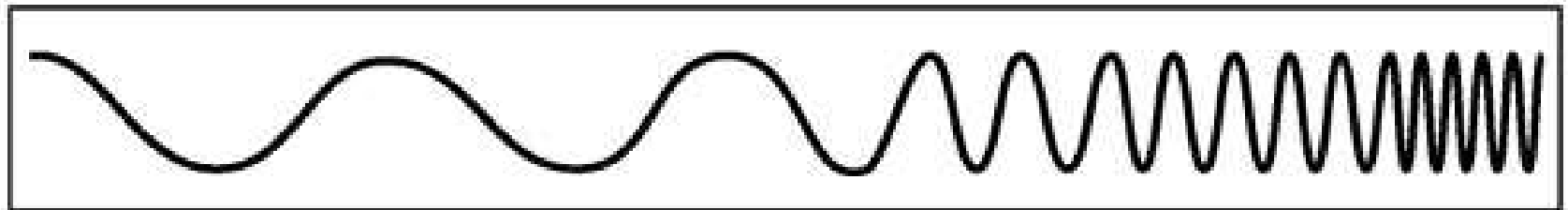
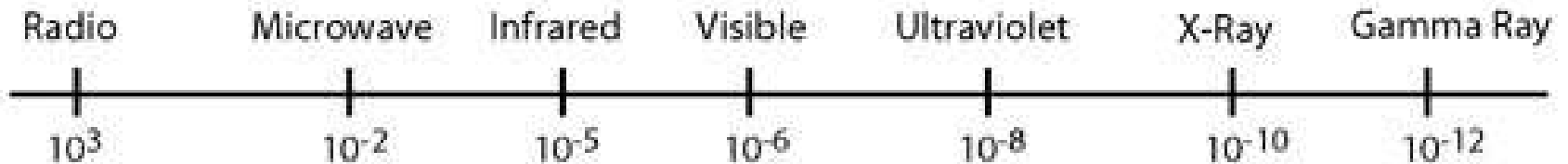
THE ELECTROMAGNETIC SPECTRUM

- Human Visible Range: 400 nm (violet) – 700 nm (red).
 - The electromagnetic spectrum consists of light at all possible energies, frequencies, wave lengths, properties.
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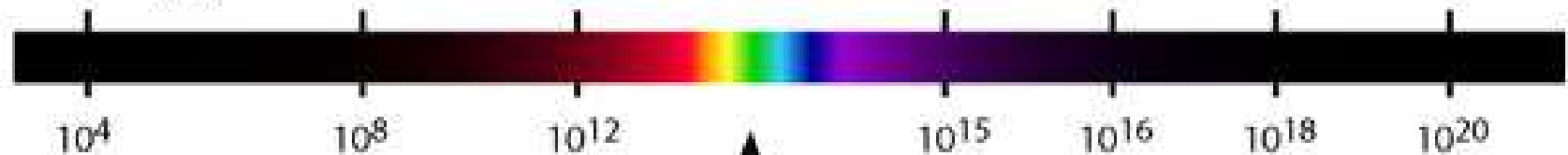
E M Spectrum contd..

THE ELECTRO MAGNETIC SPECTRUM

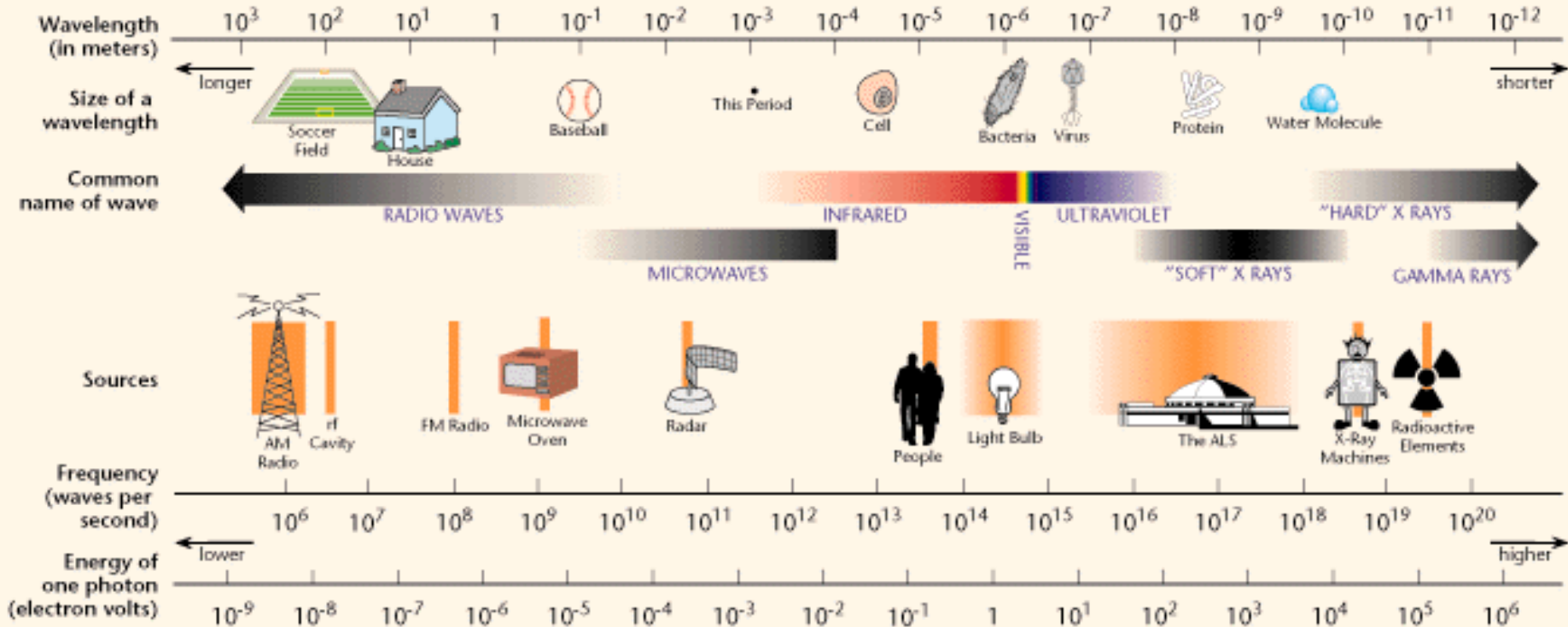
Wavelength
(metres)



Frequency
(Hz)



THE ELECTROMAGNETIC SPECTRUM



● The full range of light

EM spectrum in order

Radio Waves

Microwaves

Infrared

Visible light

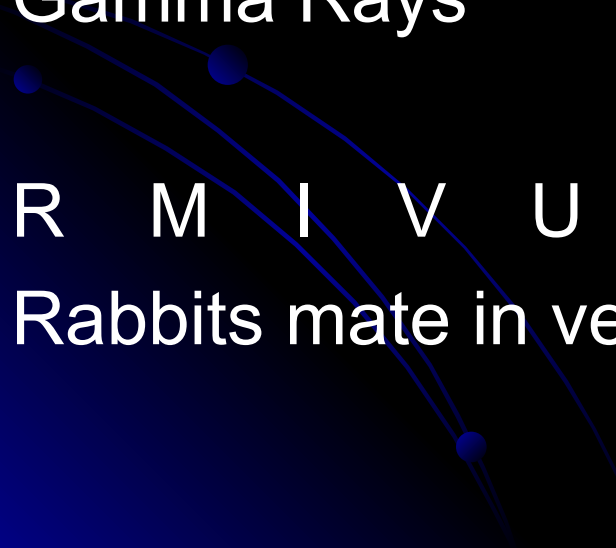
Ultraviolet rays (UV)

X-Rays

Gamma Rays

R M I V U X G

Rabbits mate in very unusual x-citing gardens



Pneumonic

- To remember the EM spectrum in order just think
- Rabbits Mate In Very Unusual Xciting Gardens
- Radio Waves, Microwaves, Infrared Rays, Visible Light (ROYGBIV), Ultraviolet Rays, X-rays, Gamma Rays.
- That is in order from highest wavelength, lowest frequency
- And low energy and shortest wavelength to high frequency and high energy.

Radio waves

- Have the lowest frequency and the longest wavelength
- Includes TV signals, AM FM signals and other radio waves.



AM =
amplitude modulation
FM =
frequency modulation

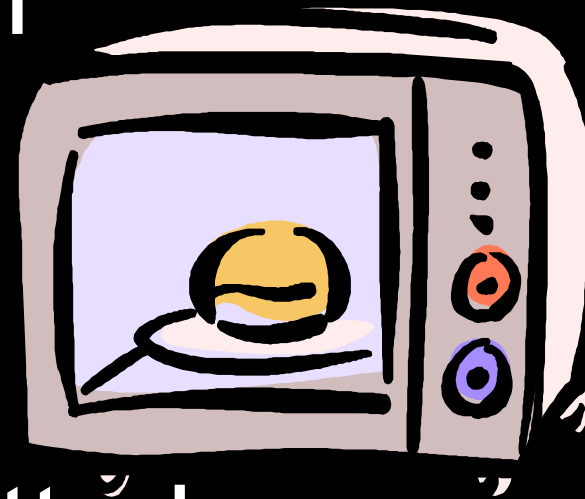


- RADAR – used by air traffic control towers at airports to determine the locations of aircrafts
- RADAR is also used by the police to monitor the speed of vehicles.
- Radar guns fire the signal with a frequency which is reflected back and the computer chip converts the difference in frequency into speed.

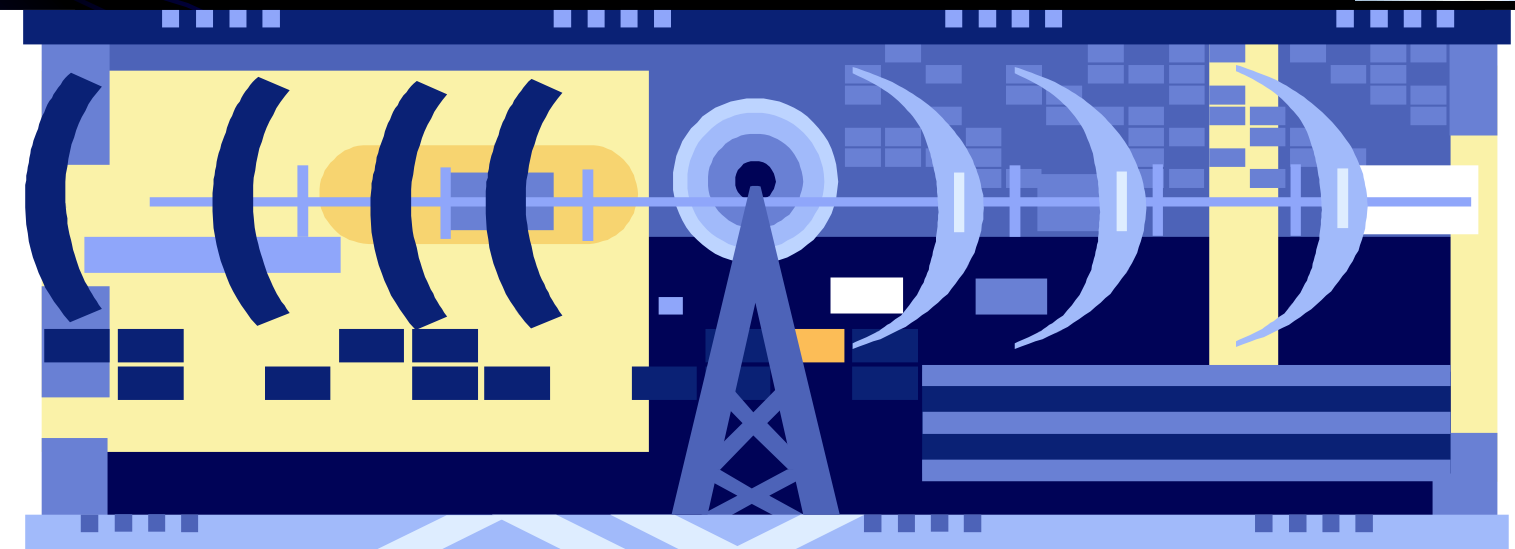


Microwaves

- Shorter wavelengths and higher frequencies than radio waves – used in cooking.
- They are reflected by metals and are transmitted through air, glass, paper, plastic – water, fats and sugar absorb microwaves.



- Also used to carry telecommunication signals.



Infrared Light

- Shorter wavelengths and higher frequencies than microwaves – it can be felt as warmth.
- IR from sun or heat lamp warms our body, food without heating continuously (reddish lamps)



● ROY G BIV

Visible Light

Red

Orange

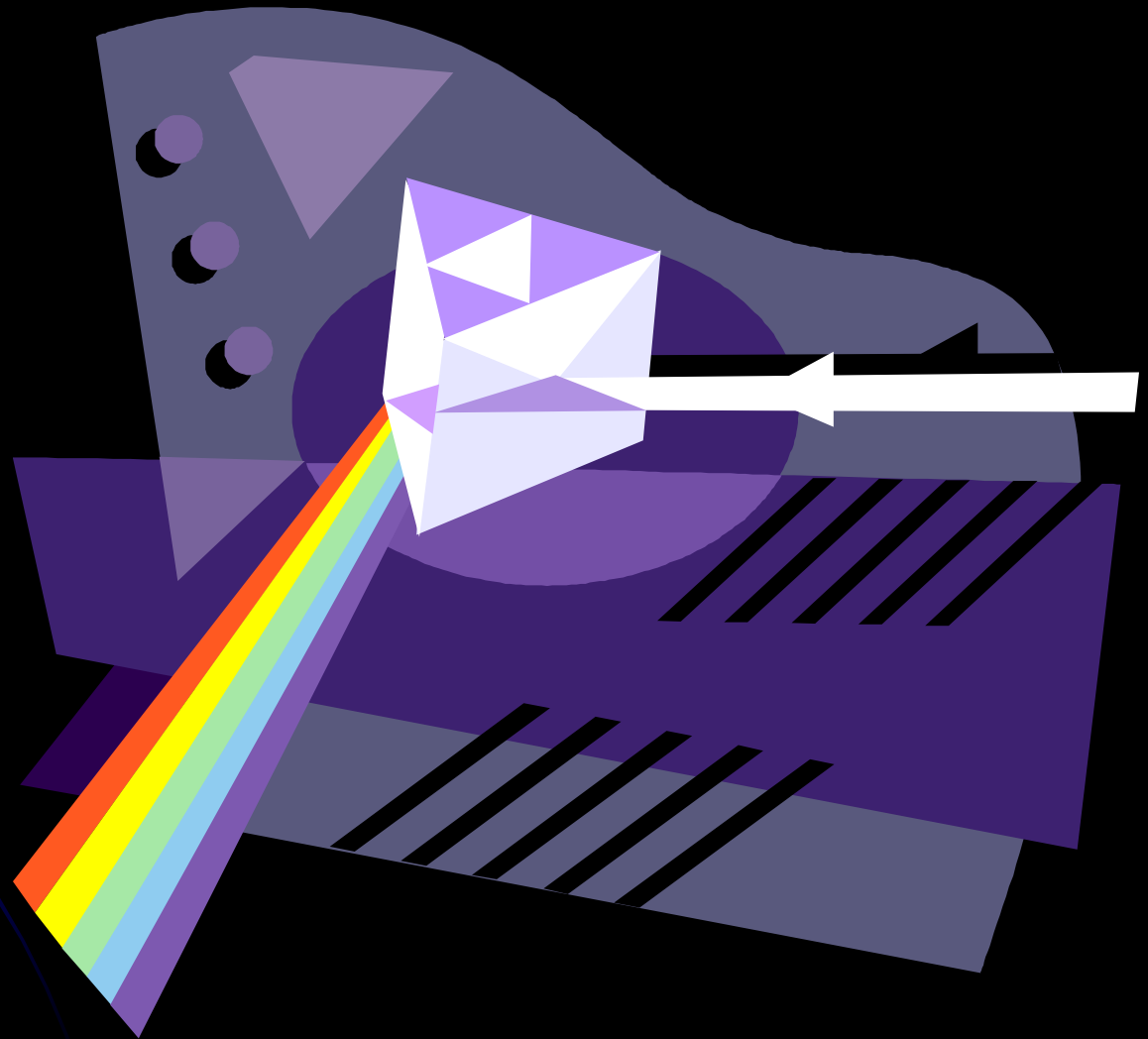
Yellow

Green

Blue

Indigo

Violet



Ultraviolet light



- Invisible light beyond violet
- Sun emits 9 % of UV rays
- May cause sun burns due to high energies.

X rays

- Beyond UV rays are X rays used to make body images. They pass through soft tissue but some are absorbed by the bones and tissues.
- The rays which pass through, form an image on the photographic plate.

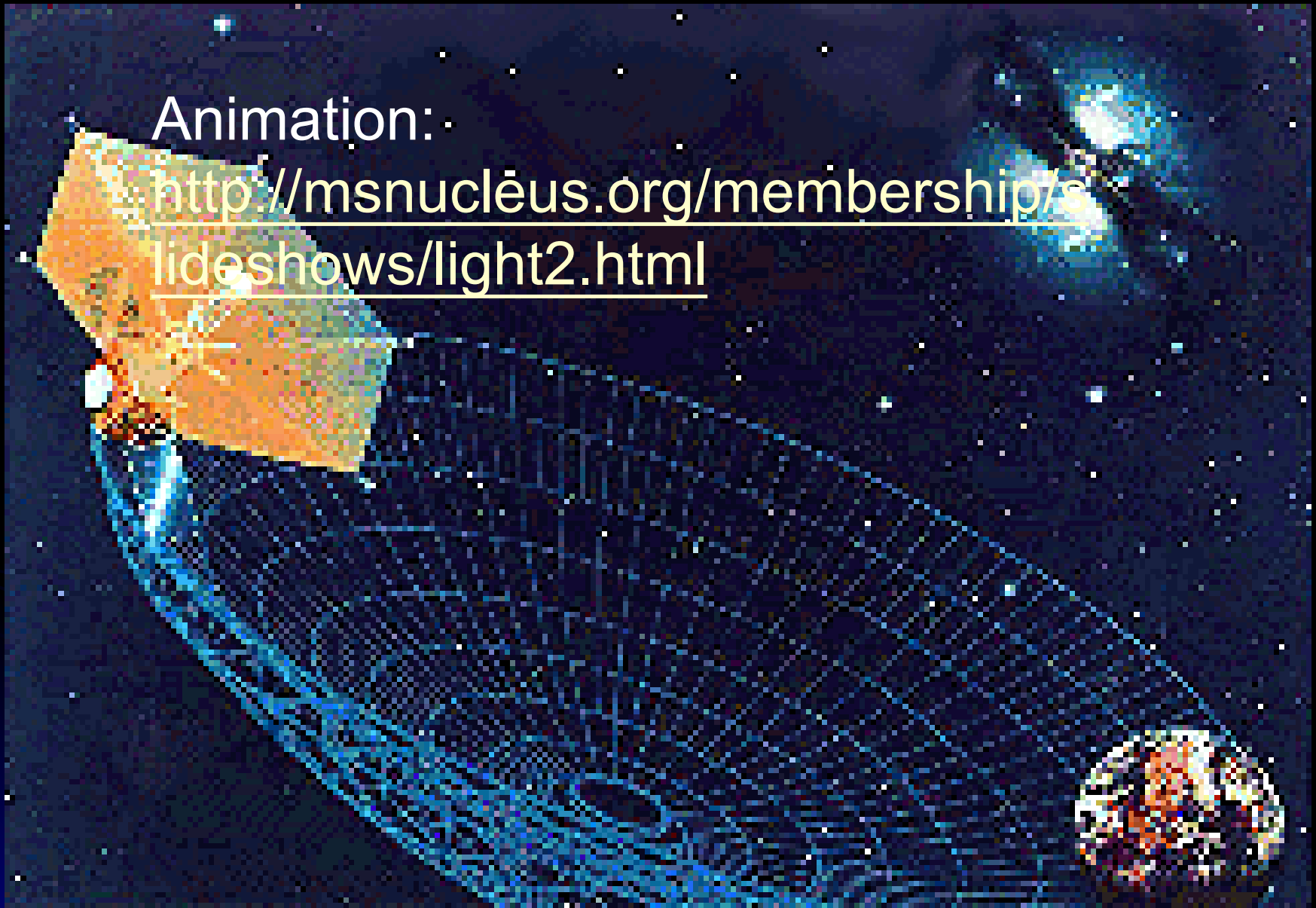


Gamma Rays

- Beyond x-rays – highest energy waves.
- Both X and gamma rays may be dangerous as they can kill the living cells due to their high energies.
- However gamma rays may be used to treat cancer by killing the diseased cells

Animation:


<http://msnucleus.org/membership/slideshows/light2.html>



Review Questions????

- 1) Which of the waves in the electromagnetic spectrum has the greatest energy?
- 2) Which wave is used in the kitchen for cooking?
- 3) What is the expanded form of RADAR?
- 4) Which of the waves have the highest wavelength?



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- 5) Which wave has the greatest frequency?**
- 6) How are sun burns caused in human beings? Which waves are responsible for it?**
- 7) What part of the electromagnetic spectrum may be used to kill the cancer cells?**
- 8) What is the use of the infrared waves?**

Answers:

- 1) **Gamma rays**
- 2) **Micro waves**
- 3) **RAdio Detection And Ranging**
- 4) **Radio waves**
- 5) **Gamma rays**
- 6) **UV rays from the sun**
- 7) **Gamma rays**
- 8) **Used for warmth ex:
keeping food warm**



Wavestown

