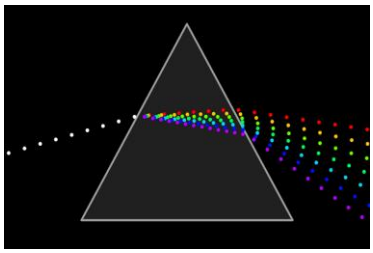
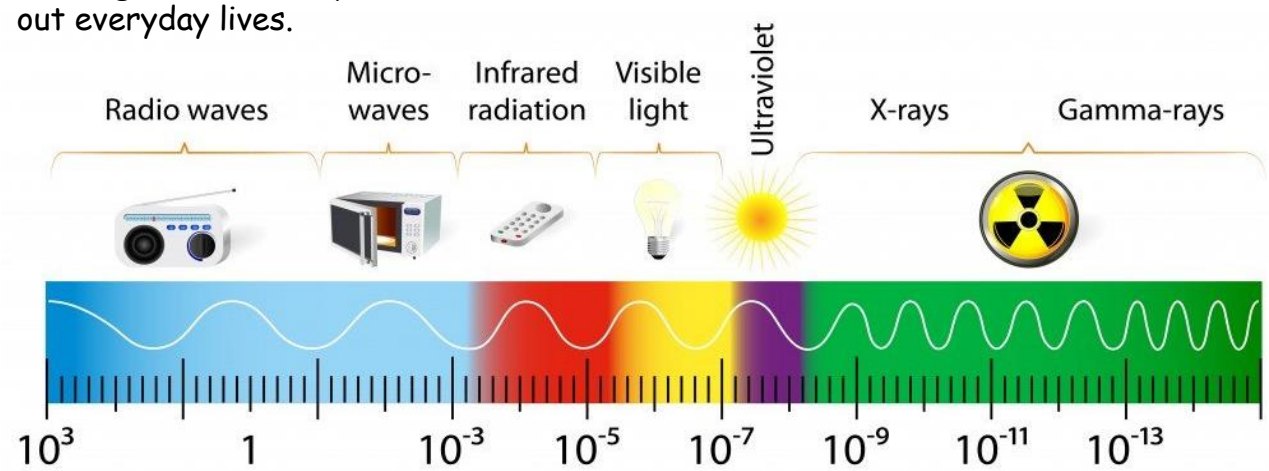
Electromagnetic Spectrum

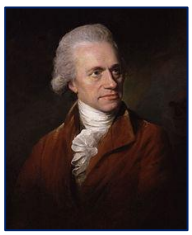
Our eyes can see things because light waves travel from the sun or a light source, reflect off of an object and into our eyes.
Inside our ours are special light detectors.



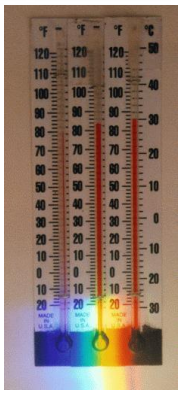
Visible light is a transverse wave (up and down wave) just like other electromagnetic waves.
Visible light forms one of the seven waves of the electromagnetic spectrum, it is the only one we can see with our naked eye

Visible light is made up from the colours of the rainbow. Each of these colours has a different size wave (wavelength)
Red has the longest wave length and Violet has the shortest wavelength.
If a wave has a longer wavelength than red light it falls into a different part of the **ELECTROMAGNETIC SPECTRUM**, it would be **INFRARED**
If a wave has a shorter wavelength than violet light it would be **ULTRAVIOLET**.
Although our naked eye can't see these we use **INFRARED** and **ULTRAVIOLET** in out everyday lives.





William Herschel discovered infrared radiation in 1800. Herschel passed sunlight through a prism. As sunlight passes through the prism, the prism divides it into a rainbow of colors called a spectrum Herschel was interested in measuring the amount of heat in each color.



To do this he used thermometers with blackened bulbs and measured the temperature of the different colors of the spectrum. He noticed that the temperature increased from the blue to the red part of the spectrum. Then he placed a thermometer just past the red part of the spectrum in a region where there was no visible light and found that the temperature there was even higher. Herschel realized that there must be another type of light which we cannot see in this region. This light is now called **INFRARED**.

Electromagnetic Spectrum

How do our eyes see things?

……

……

EXTN: What do you think determines the different colours of things we look at?

……

What are the different colours of visible light? ……

……

Write the waves of the electromagnetic spectrum in the correct order.

Which wave….?

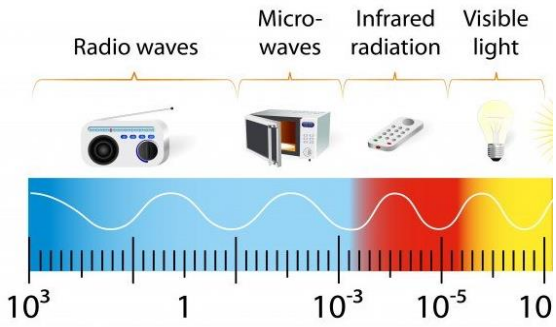
1. Has the shortest wavelength? ……
2. Has a frequency between gamma and UV? ……
3. Can be seen by humans? ……
4. Has the lowest frequency? ……
5. Has a wavelength just longer than IR? ……
   ……
6. Has a frequency higher than X-rays? ……
7. In visible light has the highest frequency? ……
8. Was discovered by Herschel? ……

The waves in the electromagnetic spectrum are divided into groups according to their _____
and wavelengths.
Waves with high frequencies have _____ wavelengths, and waves with _____
frequencies have long _____.
Radio waves have the _____ frequencies and the longest _____.
Gamma rays have the highest _____ and the _____ wavelengths.
Visible light is in the middle of the electromagnetic _____.
Visible light can be divided further into the _____ colours of the visible _____.
These colours are red, _____, yellow, _____, blue, indigo and _____.
Red light has the lowest frequency and longest _____. Violet light has the _____
frequency and _____ wavelength.

Using the Waves

LONG WAVES

The uses of the different electromagnetic waves are dependant upon their wavelength. The long waves are visible light, infrared, microwaves and radio waves

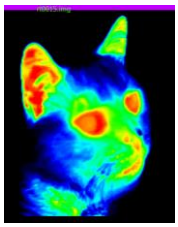


VISIBLE LIGHT

The part that our eyes can detect- allowing us to see.
Light bulbs are designed to emit visible light.
Cameras can also detect it and record images.

INFRARED

Short range communication- between computers in a room or from a remote control to the TV.
Optical fibres- send information long distances.
Grill/toaster- transfer energy to the food, which absorbs it and heats up.
Thermal imaging- show how much heat is given off by different objects.
Security Systems- sensors that detect IR or infrared beams and detectors that set off alarms when someone breaks the beam.



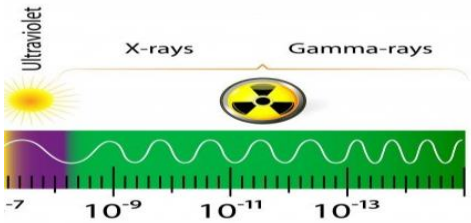
MICROWAVES

Communication- satellite transmissions and mobile phone signals.
Microwaves- transfer energy to food, heating it up inside.

RADIOWAVES

Communication- transmitting radio broadcasts or TV programmes. Can be sent via satellite with controllers on the ground communicating with spacecraft using radio waves.

SHORT WAVES



ULTRAVIOLET

Security- Marking personal items and checking banknotes
Cleaning- Used to disinfect water
Light bulbs- Produced inside fluorescent lamps

X-RAYS

Security- Used in airports to scan luggage and people
Medical – Taking pictures of bones. Bones absorb more x-rays than muscle and fat so can make an image of inside the body

GAMMA RAYS

Gamma rays are the most dangerous and carry the most energy. They are used to sterilise food and surgical equipment as well as in radiotherapy to kill cancer cells.

Using the Waves

1. How do our eyes allow us to see things?

.....

.....

2. What is detected by thermal imaging cameras?

.....

.....

3. What do microwaves do to food?

.....

.....

4. How might we communicate with spacecraft using radio waves?

.....

.....

5. What do cameras detect?

.....

.....

6. List 3 uses of infrared.

.....

.....

7. Which waves are used for communicating?

.....

.....

8. How do you change the channel with your remote?

.....

.....

9. How would an infrared security system keep your home safe?

.....

.....

10. How are two of the waves used for cooking?

.....

.....

Decide whether the following statements are true or false