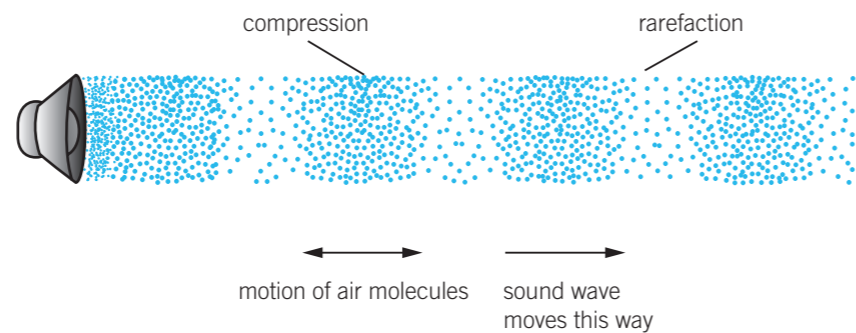


### Sound waves

- Any **wave** transfers energy from one place to another
- Sound waves cause particles to vibrate backwards and forwards in the direction of the wave, this produces areas of high pressure (**compression**) and low pressure (**rarefaction**)
- As there are areas where the air pressure is different in a sound wave, we can call sound waves a type of **pressure wave**

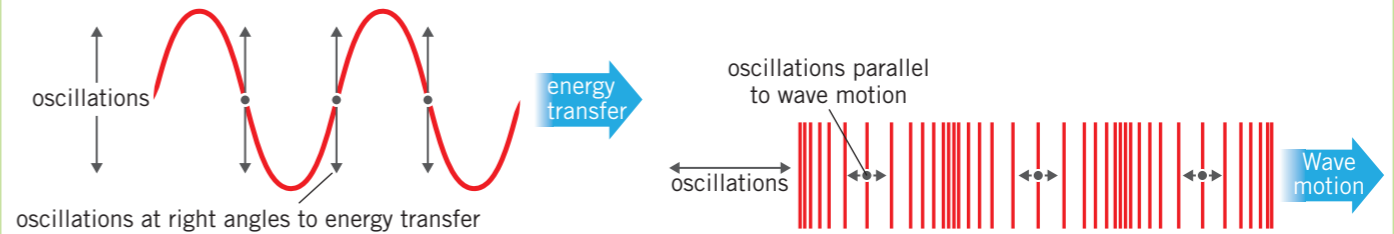


- Sound can be detected with a **microphone**, the microphone will change air pressure into a changing potential difference
- Sound can be produced with a **loudspeaker**, the changing potential difference causes changes in air pressure
- Changes in air pressure will be caused by the diaphragm of the loudspeaker vibrating and causing the movement of the air particles

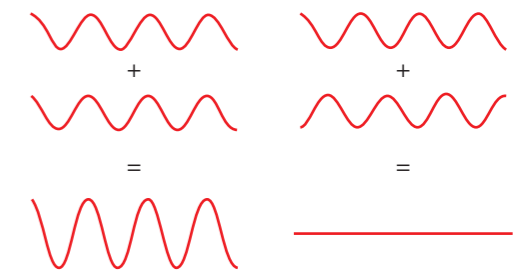


### Types of waves

- Transverse waves** vibrate at 90° to the direction at which they are travelling, they move up and down as well as forward
- Longitudinal waves** vibrate in the direction in which they are travelling



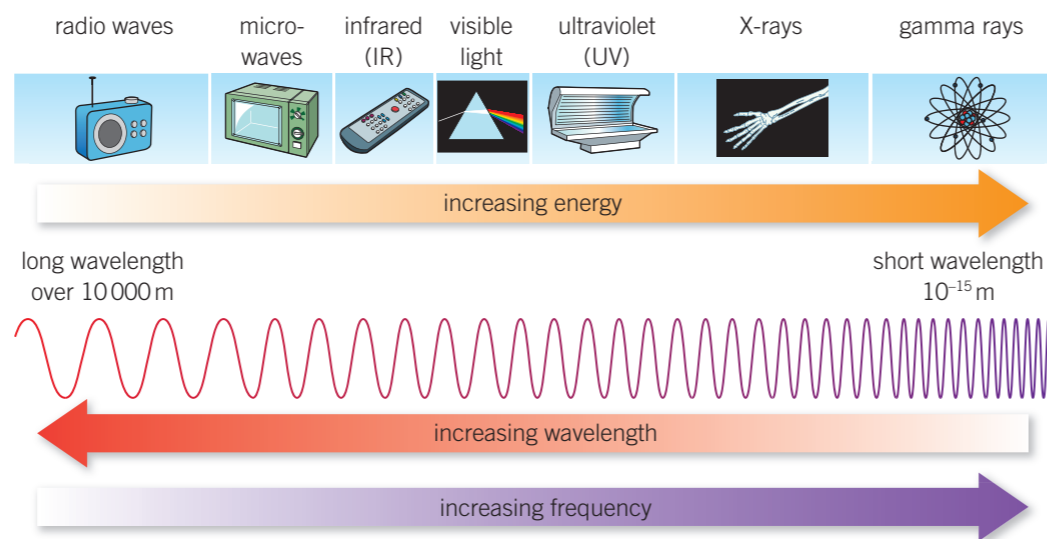
- When waves are put together they **superpose**, this means they will either add together or cancel each other out
- When the waves are in line with one another they add together, increasing the amplitude of the wave
- When the waves are not in line, they will cancel each other out, decreasing the amplitude of the wave



### Ultrasound

- Humans can hear sounds with a frequency between 20–20000Hz.
- ultrasound** is any sound with a frequency of higher than 20000Hz
- As ultrasound has a high frequency it causes the particles it interacts with to vibrate more quickly, this means that it can be used in:
  - Ultrasonic cleaning – dirt particles are 'shaken' off of objects
  - Physiotherapy – the ultrasound waves causes liquid particles in the body to move more quickly and hence get warmer

### Electromagnetic spectrum

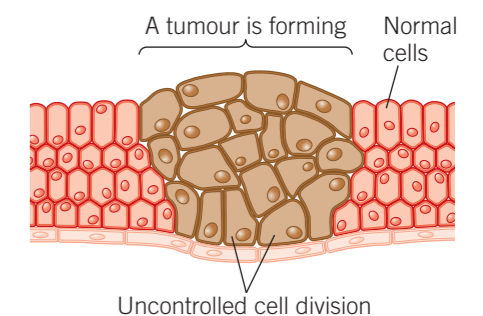


### Uses of the electromagnetic spectrum

<b>Radio waves</b>	TV signals
<b>Microwaves</b>	Mobile phones
<b>Infrared</b>	Heating and cooking
<b>Visible light</b>	Photography
<b>Ultraviolet waves</b>	Detecting forgeries, sunbeds
<b>X-rays</b>	Imaging broken bones
<b>Gamma rays</b>	Killing cancer cells

### Ionisation

- The higher the frequency of the wave, the higher the energy
- High energy waves can lead to **ionisation**, where electrons are knocked off of atoms in cells
- This can cause mutations in cells if the DNA is affected and this can lead to cancerous tumours forming
- The ionising waves in the electromagnetic spectrum are gamma, X-rays and ultraviolet rays



### Key terms

Make sure you can write definitions for these key terms.

compression electromagnetic spectrum gamma rays infrared ionisation longitudinal wave loudspeaker microphone microwaves  
pressure wave radio waves rarefaction superpose transverse wave ultrasound ultraviolet visible light wave X-rays