Energy and Sound Need to Know 2019

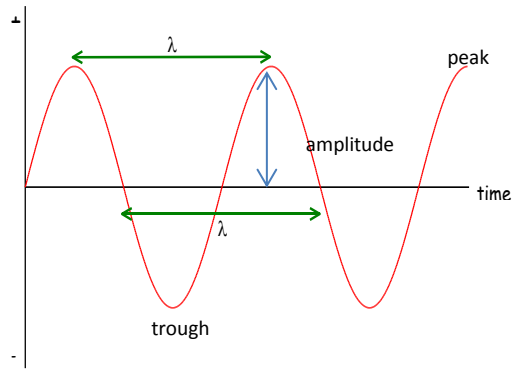
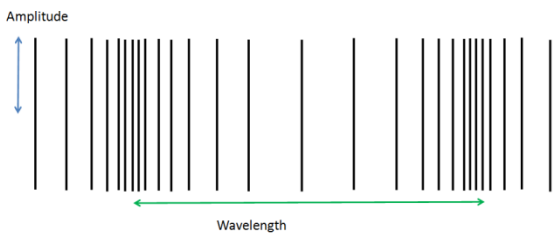
Energy

- Energy is needed to get jobs done, or make things work.
- The unit of energy is the joule , and has the symbol (J)
- Energy can be transferred from one object to another or can be converted from one form to another.
- Energy transfers can happen in more than one stage.
- The total amount of energy in a transfer is always the same – it is conserved. i.e: the amount of energy before a transfer is always equal to the amount of energy after the transfer, but not all of the energy is useful.
- Energy is wasted as heat during each energy transfer.

Type of energy	**About this energy**
Kinetic	Makes things move (also called movement energy)
Electrical	Energy that is stored in a charged particle within an electric field)
Heat	Objects can give out heat energy (e.g. a fire)
Sound	Energy can be radiated away as sound (e.g. from a drum)
Light	Energy can be radiated away as light (e.g. in a bulb)
Nuclear	Can generate nuclear power – stored in atoms
Chemical	Stored in substances such as food or fuel
Strain/elastic energy	Stored in an elastic object, e.g spring, rubber band
Gravitational potential energy	Stored in objects above the Earth's surface

Waves

- There are two types of wave – longitudinal and transverse

Transverse	Longitudinal
	
The direction of particle movement is PERPENDICULAR (at 90˚) to the direction of the wave. Examples are water waves and em spectrum waves	The direction of particle movement is parallel (moving the same way) to the direction of the wave. Examples are sound waves

- There are several features to a wave:

Wavelength	The length of one complete wave(e.g. crest to crest or similar). Measured in metres (m).
Amplitude	The distance from the axis to the crest or from axis to the trough. Measured in metres (m).
Frequency	The number of waves per second. Measured in Hertz (Hz).
Period	The time taken for one complete wave to pass. Measured in seconds (s)
Energy	Dependant on amplitude- the larger the amplitude, the larger the Energy
Crest (sometimes called Peak)	The highest point on the wave
Trough	The lowest point on the wave

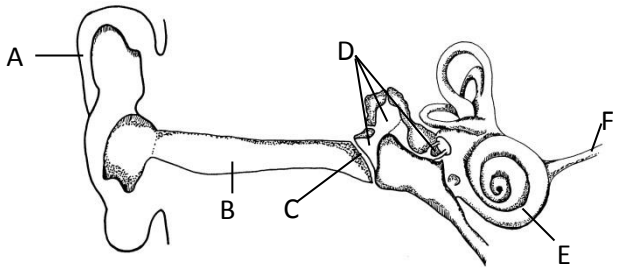
Sound

- Sound is a wave which carries energy from one place to another. The greater the energy of the wave the greater its amplitude.
- Sound is caused by vibrating objects.
- Sound travels through air at approximately 340 metres per second. The speed of light in air is 300 million metres per second.
- Lightning and thunder is an example to show that speed of light is very much greater than the speed of sound.
- Sound travels in solids, liquids and gases but not in a vacuum.
- Sound travels fastest in a solid and slower in a gas.
- To measure the speed of sound, measure a known **distance**. You should record the **time** it takes for the sound to travel the known distance. To calculate the speed of sound, use Speed = distance ÷ time (written as $v = \frac{d}{t}$)

Hearing

- The range of human hearing is 20 – 20,000 Hz
- Sound levels are measured in decibels dB
- Loud sounds can permanently damage hearing.
- The danger level at which sound can permanently damage hearing is 85dB.
- The louder the sound the shorter the time it will take to permanently damage hearing.

- When looking at sound waves using an oscilloscope:
  - The frequency of a sound note is given by the pitch. Higher pitched noises have a higher frequency
  - Sounds above the range of human hearing are called ultrasounds.
  - The volume of a sound note is indicated by the amplitude. The louder the sound is, the greater the amplitude
  - If two notes are an octave apart the upper note has twice the frequency of the lower note
  -
- Cupping our ears **(giving a curved reflector)** results in us collecting more sound and we hear more.
- Cupping our ears with our hands pointing backwards results in us reducing the sound level in our ears.
- Sounds above the range of human hearing are called ultrasounds.
- The parts of the ear and function are labelled below:



	Part	**Function**
A	Pinna	Funnels the sound waves travelling through the air into the ear canal.
B	Ear canal	Passage from outer ear to ear drum
C	Ear drum	The sound waves make the ear drum vibrate.
D	Middle ear bones	These pass the vibrations to the spiral cochlea.
E	Spiral cochlea	Contains a liquid and nerve cells. When the liquid vibrates it stimulates the nerve endings to create a signal
F	(Auditory) Nerve	Carries the signals from the ear to the brain.