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.

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| **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

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| Transverse | Longitudinal |
| amplitudecresttrough |  |
| 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 two types of wave – longitudinal and transverse
* There are several features to a wave:

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| 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:

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|  | **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. |

* 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:

E

F

B

A

C

D