OCR (B) Physics GCSE

PAG 4: Measuring Waves

Using a ripple tank to measure the speed, wavelength and frequency of waves

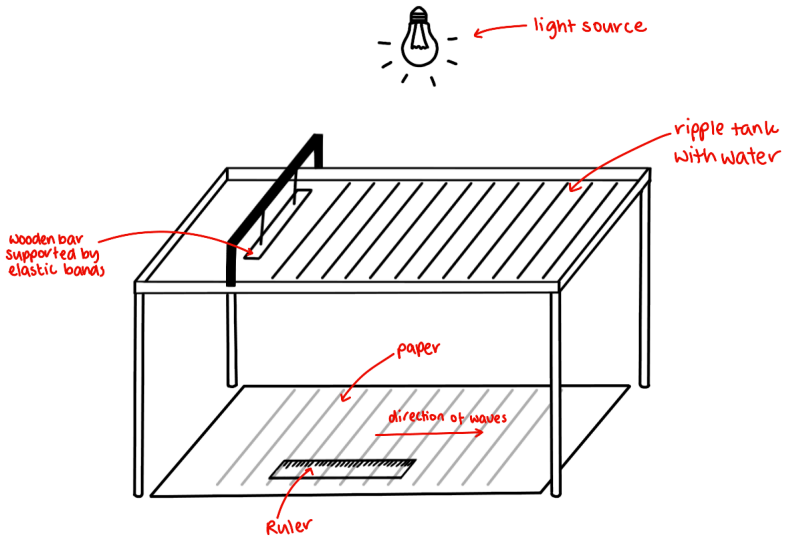
Ripple Tanks

These are **shallow glass tanks** with a needle/paddle which **oscillates**, producing **water waves** at a determined frequency.

If light is shone through it, dark/light patches will appear underneath it, as light passes through crests and troughs respectively (when light passes through a **crest**, it passes through the most amount of water possible, so is **scattered** the most and appears the **darkest**).

By counting the number of times a dark (**maximum**) passes through the point in 60 seconds and dividing by 60, you get the number of oscillations per second (**frequency**).

The **wavelength** can be measured by using a **stroboscope** at the **same frequency** as the waves, so the pattern of waves appears fixed on the screen. Then the **distance** between two maxima can be measured to calculate wavelength.



$$c = f\lambda$$

(c, the speed of light, is a constant value: 3×10^8 m/s)

Alternatively, one person can **draw** a line on the screen, keeping the pencil in line with a chosen maximum, whilst the other person records the **time taken to draw** the line.

Then use the equation of distance / time = speed.

Wavelength can also be measured with a ruler, though it may be tricky if the waves are moving.

Modelling in Ripple Tanks

- **Reflection** can be shown by the waves hitting a **wall**
- **Refraction** can be shown by placing a **thick glass sheet** in the tank (only covering some of the tank floor)
    - The **depth** of water becomes shallower here
    - So as **speed** depends on depth, the ripples **slow down**, mimicking how waves slow down when entering a denser medium