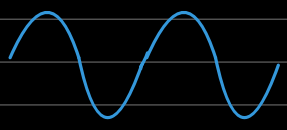
WAVES

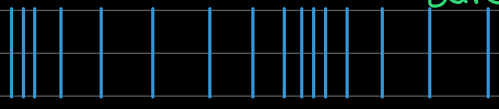
Types of Waves :

1. Progressive Waves
   waves which travel or move and as they move, they transfer energy from one point to another

   i) Transverse - Direction of vibration is perpendicular to the direction in which the wave travels



   ii) Longitudinal - The direction of vibration is parallel to the direction in which the wave travels



PROPERTIES OF WAVES

1. Reflection
2. Refraction → O levels content

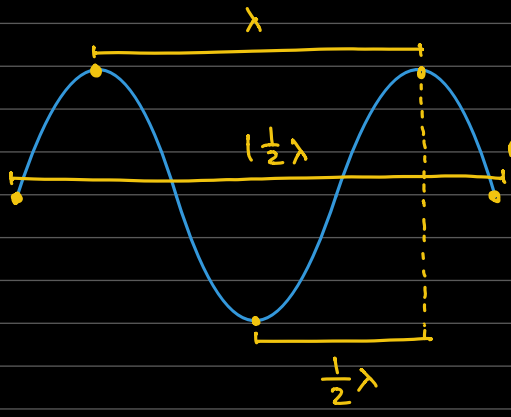
3. Superposition
4. Interference
5. Diffraction

} AS Level Content

TERMINOLOGY

Path Difference

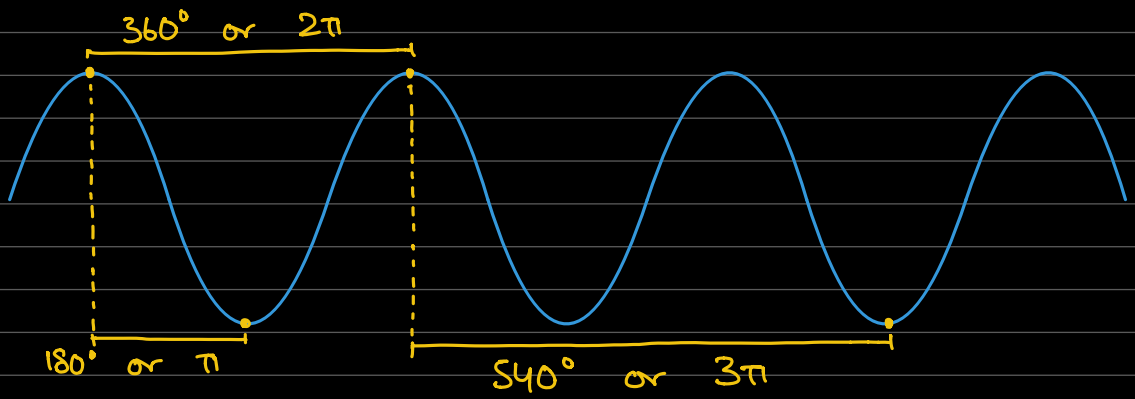
Refers to the distance between any two points on a wave measured in terms of wavelength (λ).



→ these are path differences

Phase Difference

Refers to distance between any two points on a wave measured either in degrees (°) or in radians (rad.)



- A path difference of one λ (one wavelength) corresponds to a phase difference of 360° or 2π radians

In-Phase Points

- Two points, if upon comparison, exhibit identical behaviour, then they are said to be in-phase with each other
- Examples could be: a crest if compared with another crest
  <u>OR</u>
  a trough if compared with another trough
- In-phase points must have a path difference of 1λ, 2λ, 3λ... $n\lambda$ where n is an integer value

  <u>AND</u> They must have a corresponding phase difference of 2π, 4π, 6π .... $n\pi$ where n is an integer multiple of 2

Out of Phase points

- Two points, if upon comparison, exhibit exactly opposite behaviour then they are said to be out of phase with each other
- Example could be: a crest if compared to a trough
- For out-of-phase points, they must have a path difference of $\frac{1}{2}\lambda$, $\frac{3}{2}\lambda$, $\frac{5}{2}\lambda$ .... $n\frac{\lambda}{2}$ where n is an odd integer.

  <u>AND</u> they must have a corresponding phase difference of $\pi, 3\pi, 5\pi$ ... $n\pi$ where n is an odd integer

Example Question :

Q. $v = 640\,ms^{-1}$ Calculate the phase difference between two points on this wave which are separated by a distance of 0.4 m.
$f = 800\,Hz$

$v = f\lambda$

$640 = 800\lambda$

$\frac{640}{800} = \lambda$

$0.8 = \lambda$

$0.4\,m = \frac{1}{2}\lambda \rightarrow$ phase difference $= \pi$ rad.

↓

Ans