



THE SCIENCE
ACADEMY

WAVES

A LEVEL H2 PHYSICS

JULY E-TRIAL

THE SCIENCE ACADEMY



PROGRESSIVE WAVES

A progressive wave is defined as ...

As a progressive wave passes through a medium, the particles will oscillate.

A transverse wave is ...

A longitudinal wave is ...



PROGRESSIVE WAVES

The amplitude is defined as...

The period is defined as...

The frequency is defined as...

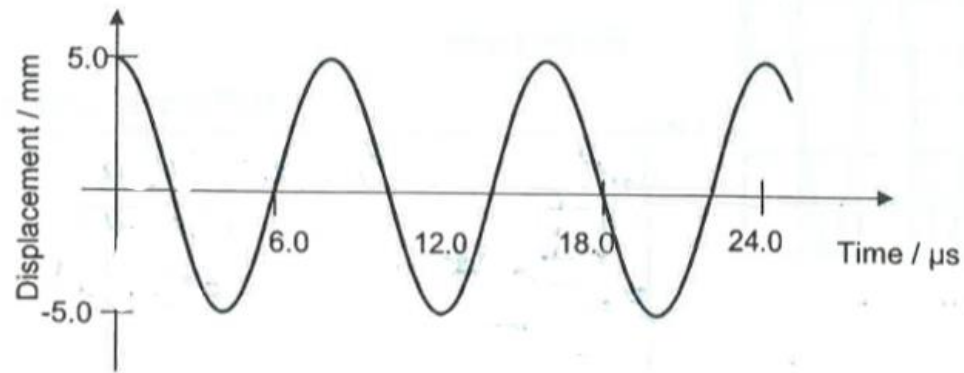
The wavelength is defined as...

The speed of a wave is given by...



WORKED EXAMPLE 1

The graph below represents the simple harmonic motion of a particle in a progressive wave traveling at a speed of 4.0 m.s^{-1} .



Determine, for the wave,

- its amplitude,
- its frequency,
- its wavelength.



PHASE

The mathematical expression of a sinusoidal progressive wave is given by...

Where θ represents the angular phase of the particle's oscillation

The angular phase of the particle at a displacement of x from the origin at a time t is given by



PHASE

The phase difference between two particles separated a distance of Δx is given by

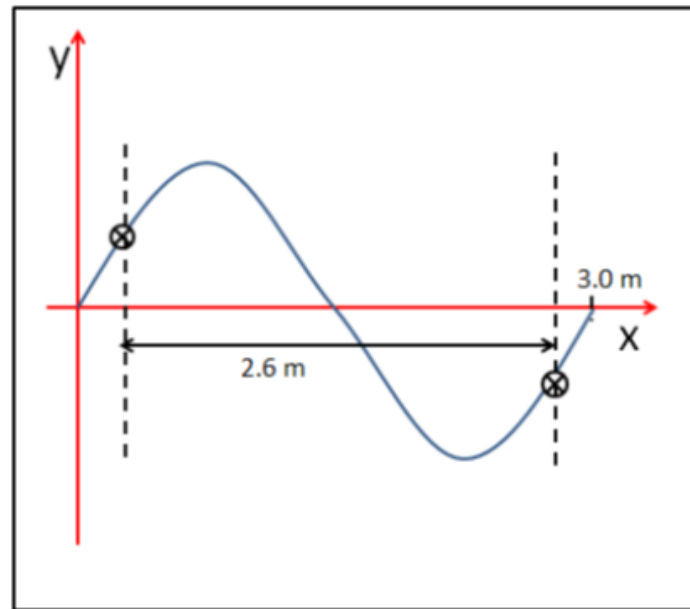
The phase difference for the same particle after a time of Δt has elapsed is given by



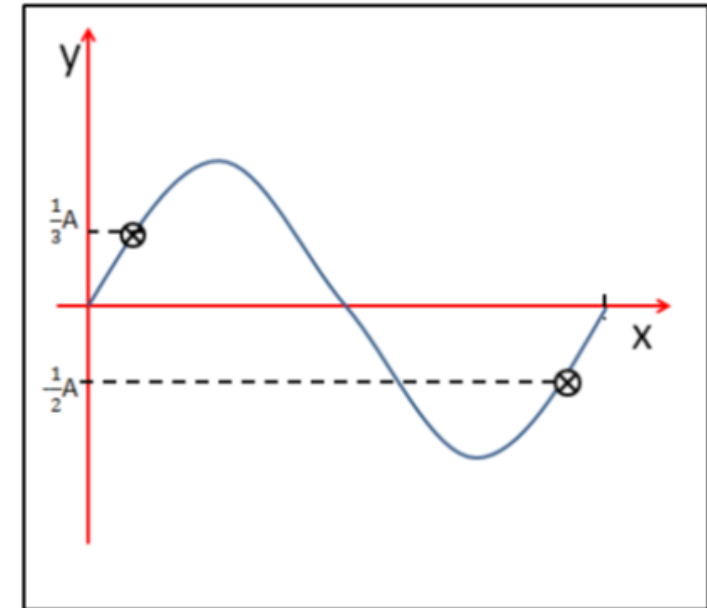
WORKED EXAMPLE 2

Find the phase difference between the two particles on

(i) Figure 1.1



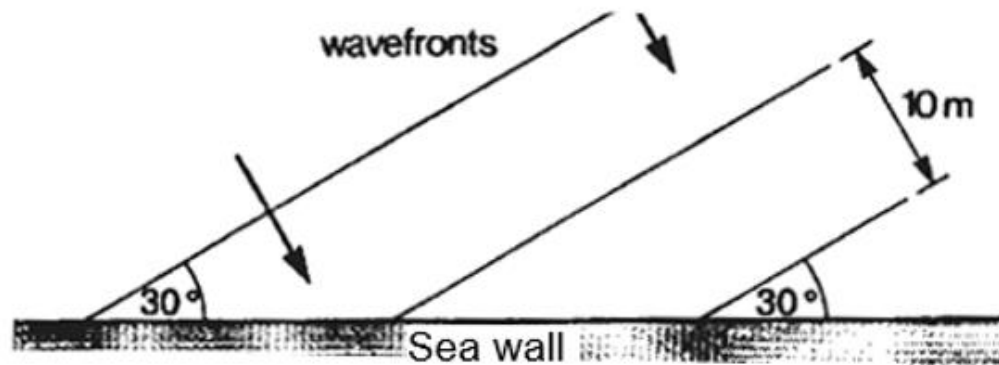
(ii) Figure 1.2





WORKED EXAMPLE 3

Parallel water waves of wavelength 10 m strike a straight sea wall. The wave fronts make an angle of 30° with the wall as shown in the figure below.

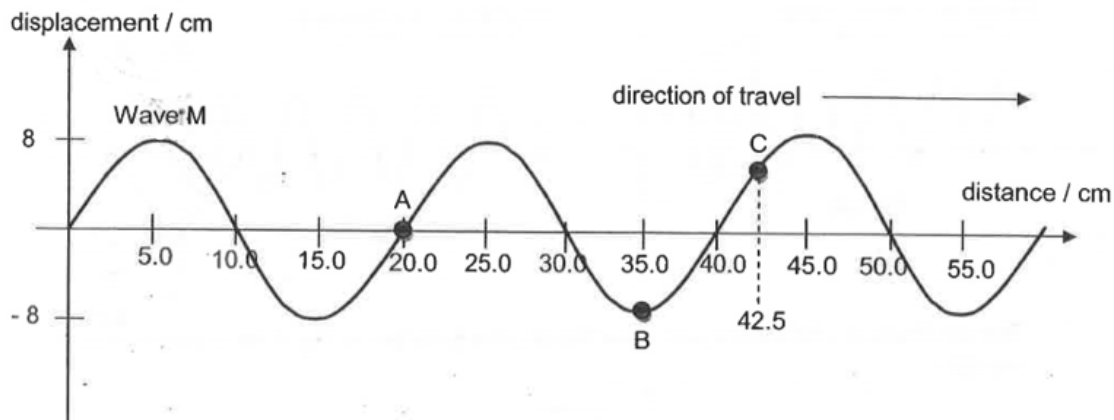


Determine the difference in phase at any instant between the waves at two points 5 m apart along the wall.



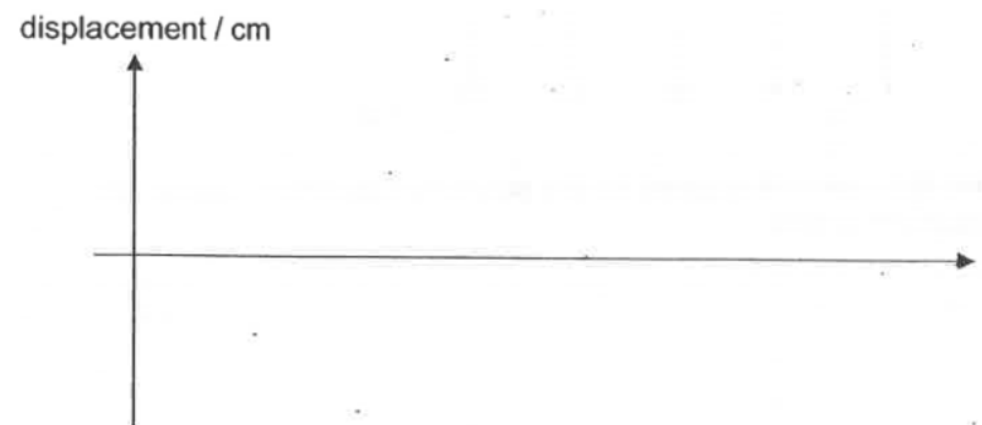
WORKED EXAMPLE 4

The figure below shows the shape of a string at a particular instant in time ($t = 0$ s) as a progressive transverse wave M travels along it. The speed of wave M is 0.400 m.s^{-1} .



- (a) Explain what is meant by the terms
- progressive, and
 - transverse.

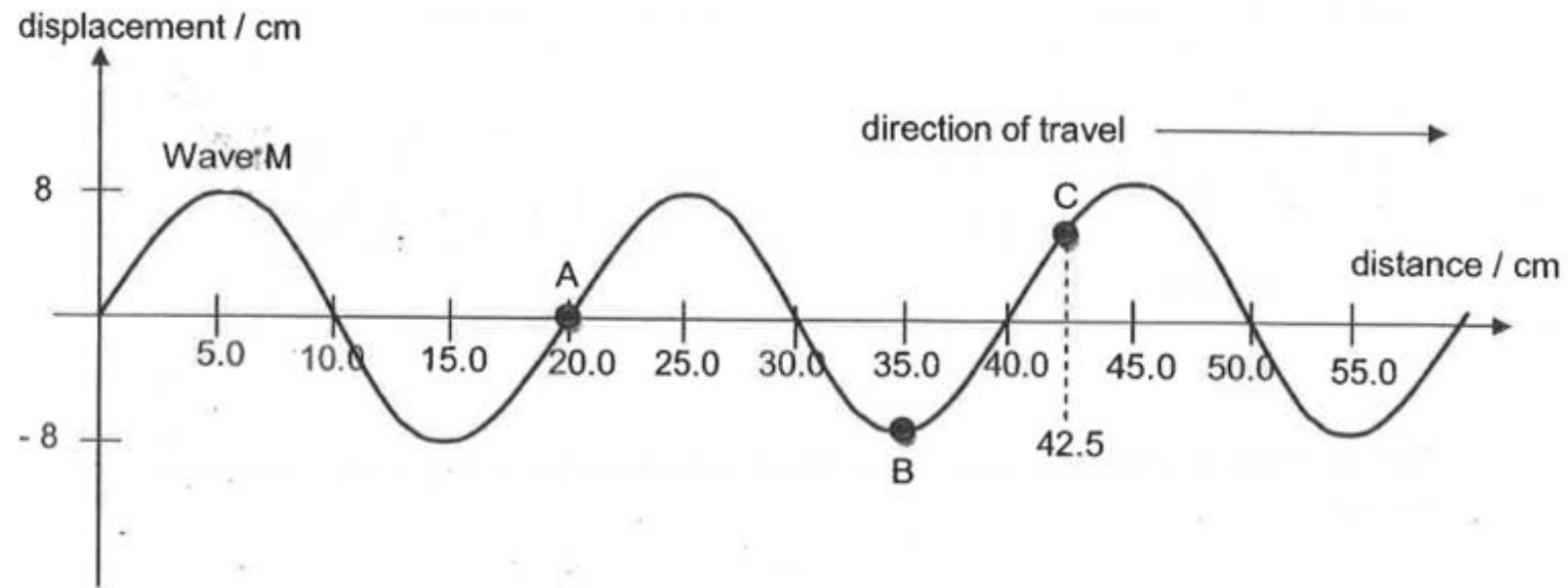
- Calculate the speed of the particle A at this instant.
- Calculate the phase difference between particle A and particle C.
- Sketch on the axes below, the displacement - time graph for two complete oscillations of
 - particle A, marking out clearly on your sketch the period of its oscillation, and
 - particle C



- Hence, state which particle is leading.

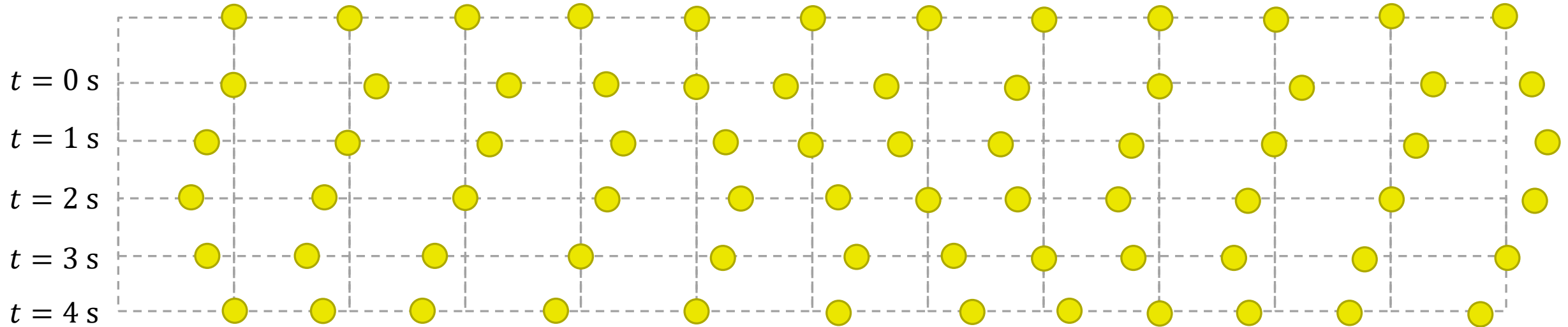


PHASOR DIAGRAMS





LONGITUDINAL WAVES





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INTENSITY

For a given wave source, the intensity of the wave incident on a surface is defined as...



WORKED EXAMPLE 5

A small loudspeaker emits sound energy uniformly into a hemispherical region in front of itself.

- (a) If the total power of the sound emitted is 80 mW , what is the sound intensity at a distance 3 m in front of the loudspeaker?
- (b) What would be the distance from the loudspeaker at which the sound intensity was half of this value? You may assume that the loudspeaker behaves as a point source of sound energy.



POLARISATION

A transverse wave is said to be polarised when...

