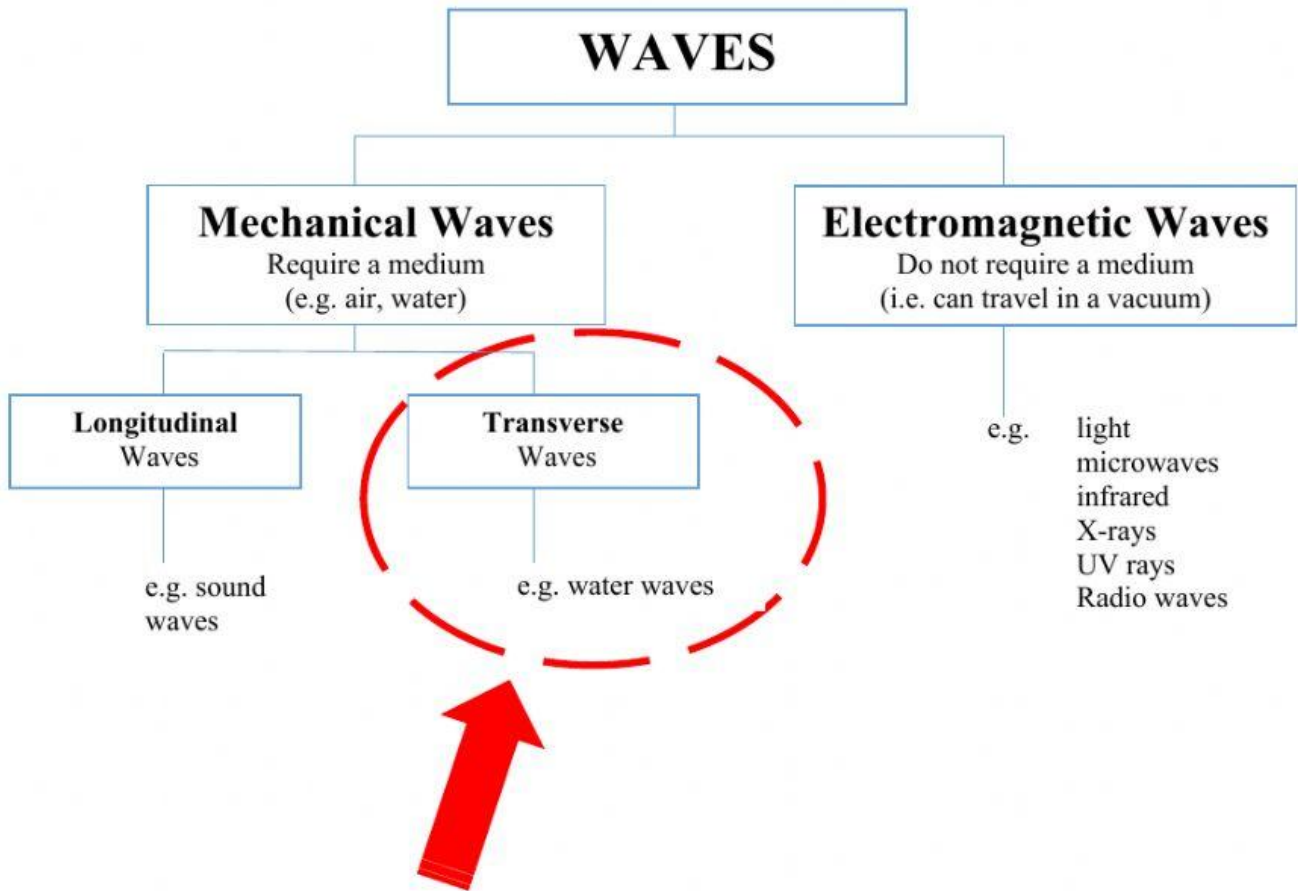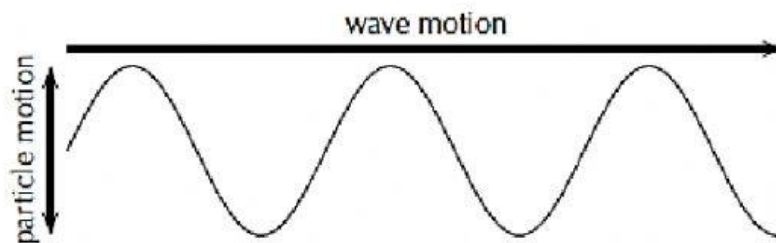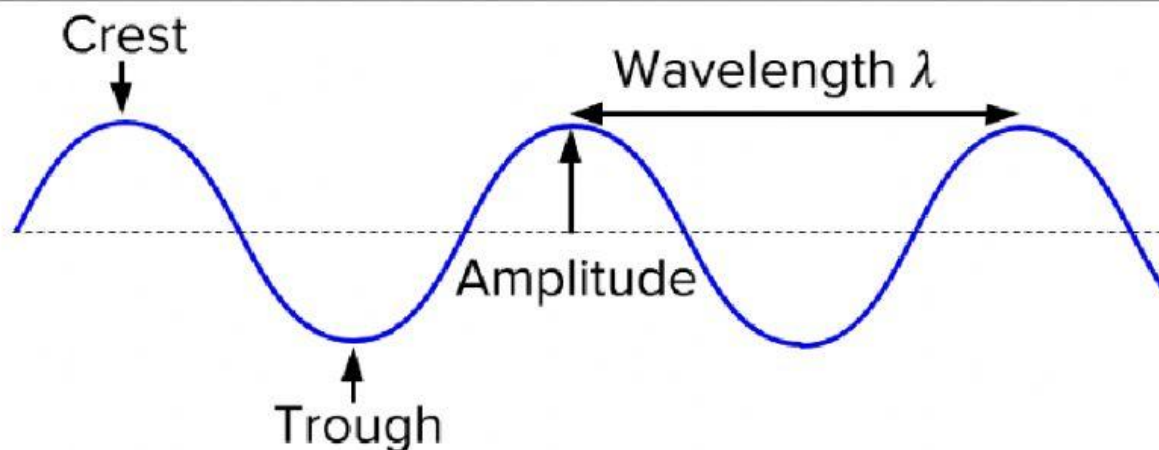# Transverse Waves

- Transverse waves are made up of a series of transverse pulses.

- An example is the waves of the ocean. The wave moves through the water, making the water move up and down while the wave itself moves perpendicular to this motion.

- Transverse waves are Mechanical Waves and therefore require a medium to move in (in the case of the ocean, the medium is the water).

A **transverse wave** is a continuous disturbance in a medium in which the particles of the medium vibrate at right angles to the direction of motion of the wave.

wave motion

particle motion

Amplitude is the maximum displacement of a particle from its equilibrium position.

Symbol: A   Unit: meter (m)

Crest

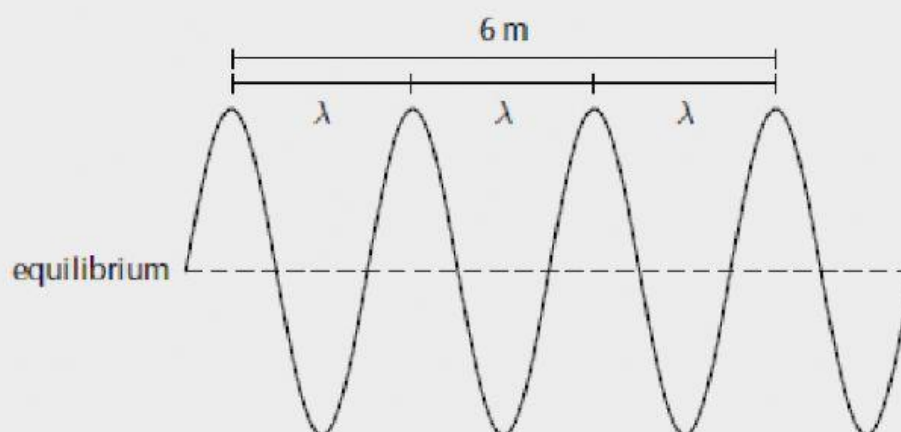Wavelength λ

Amplitude

Trough

Wavelength is the distance between two successive points in phase.

Symbol: λ Unit: meter (m)

The total distance between 4 consecutive crests of a transverse wave is 6 m. What is the wavelength of the wave?
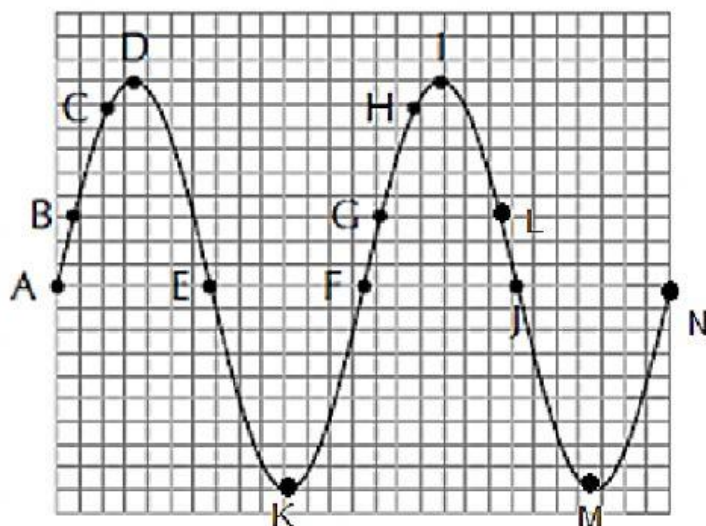
SOLUTION

Step 1 : Draw a rough sketch of the situation

6 m

λ λ λ

equilibrium

Therefore, the wavelength of the wave is:

$$3\lambda = 6\text{ m}$$
$$\lambda = \frac{6\text{ m}}{}$$
$$= $$

Don't forget the units when you write your answer!

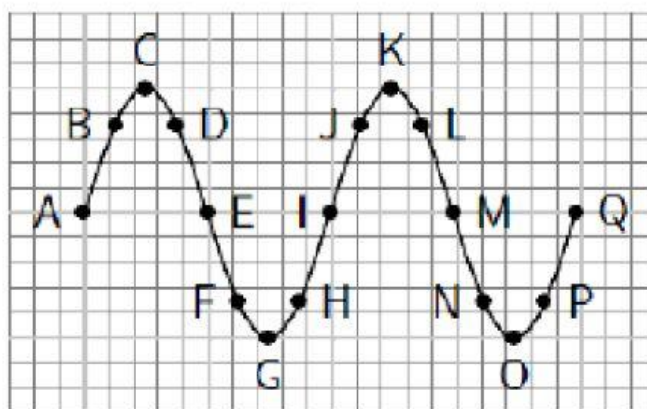**Points in phase** are separated by a whole number multiple of complete wavelengths.

(All other points are **out of phase**.)

1. Write the letter of 2 points that are crests

2. Write the letter of points that are troughs

3. Write down 4 pairs of points that are in phase

4. Write down 3 pairs of points that are out of phase

Study the following diagram and answer the questions:

1. Identify any two points that are in phase.

LIVEWORKSHEETS

2. Identify any two points that are out of phase.

3. Identify any two points that would indicate a wavelength.

Frequency is the number of wave pulses per second.

Symbol: f   Unit: hertz (Hz)

f = no of waves
    total time

Note that the unit hertz (Hz) is equivalent to "per second" (s⁻¹)

Period is the time taken for one complete wave.

Symbol: T   Unit: second (s)

The frequency and the period are related to each other. As the period is the time taken for 1 crest to pass, then the number of crests passing the point in 1 second is $\frac{1}{T}$. But this is the frequency. So
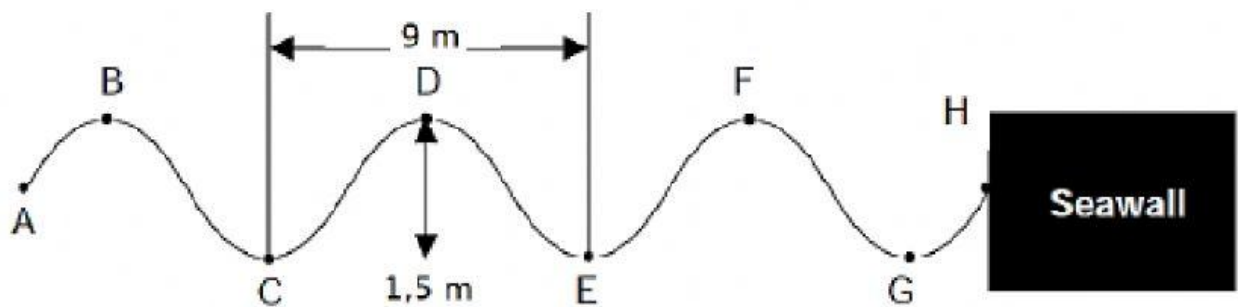
$$f = \frac{1}{T}$$

or alternatively,

$$T = \frac{1}{f}$$

> **Wave speed** is the distance travelled by a point on a wave per unit time.
>
> Symbol: v   Unit: ms^{-1}

$$v = \frac{\Delta x}{\Delta t} \qquad \text{and} \qquad v = f\lambda$$

Water waves crash against a seawall around the harbour. Eight waves hit the seawall in 5 s. The distance between successive troughs is 9 m. The height of the waveform trough to crest is 1,5 m.

a) How many complete waves are indicated in the sketch?

b) Write down the letters that indicate any TWO points that are:
i) in phase
ii) out of phase
iii) Represent ONE wavelength.

c) Calculate the amplitude of the wave.
d) Show that the period of the wave is 0,625 s.
e) Calculate the frequency of the waves.
f) Calculate the velocity of the waves.