Knowledge and Understanding to be developed:

This topic covers the basic properties of transverse and longitudinal waves and the differences between them. It introduces the wave equation and gives learners the fundamental ideas and skills they need to study both electromagnetic and sound waves.

There are a number of opportunities for the development of mathematical skills in this topic. These include applying formulae relating velocity, frequency and wavelength; showing how changes in velocity and wavelength in refraction from one medium to another are inter-related. These topics afford learners the opportunity to use ratios, fractions and percentages; to substitute numerical values into algebraic equations using appropriate units for physical quantities; to change the subject of an equation.

Key Terms to be learned this topic:

wavelength   amplitude

transverse   reflected

refracted   electromagnetic

Wavespeed   ionising

Learning Objectives and Outcomes:
Students should be able to :

(a) the difference between transverse and longitudinal waves
(b) the description of a wave in terms of amplitude, wavelength (λ), frequency (f) and wave speed (v)
(c) the graphical representation of a transverse wave, including labelling the wavelength and amplitude
(d) diagrams showing plane wave fronts being reflected or refracted, e.g. as shown by water waves in a ripple tank
(e) refraction in terms of the speed of waves on either side of a refracting boundary and the effect on the wavelength of the waves
(f) the term "radiation" to both electromagnetic waves and to energy given out by radioactive materials
(g) the characteristics of radioactive emissions and short wavelength parts of the electromagnetic spectrum (ultraviolet, X-ray and gamma ray) as ionising radiation, able to interact with atoms and to damage cells by the energy they carry
 (h) the difference between the different regions of the electromagnetic spectrum [radio waves, microwaves, infra-red, visible light, ultraviolet, X-rays and gamma rays] in terms of their wavelength and frequency and know that they all travel at the same speed in a vacuum
(i) the fact that all regions of the electromagnetic spectrum transfer energy and certain regions are commonly used to transmit information
(j) waves in terms of their wavelength, frequency, speed and amplitude
(k) the equations:
wave speed = wavelength × frequency; v f = λ and
= distance speed time
applied to the motion of waves, including electromagnetic waves
(l) communication using satellites in geosynchronous/geostationary orbit
SPECIFIED PRACTICAL WORK
• Investigation of the speed of water waves