

Chapter 14. Properties of waves

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New word list:

3.1 General properties of waves

Core**Supplement**

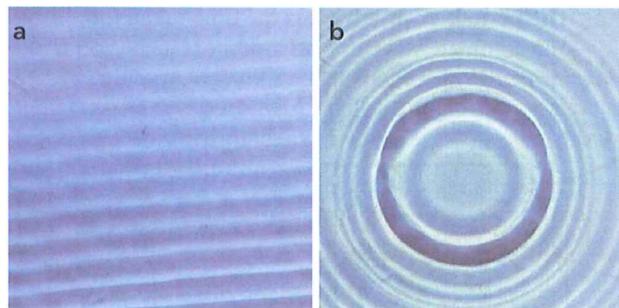
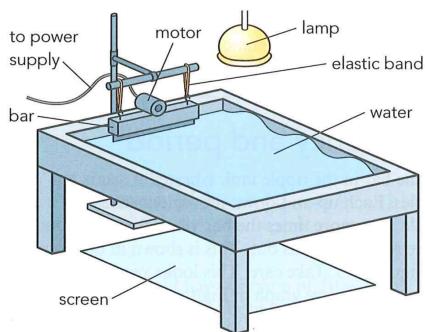
- 1 Know that waves transfer energy without transferring matter
- 2 Describe what is meant by wave motion as illustrated by vibrations in ropes and springs, and by experiments using water waves
- 3 Describe the features of a wave in terms of wavefront, wavelength, frequency, crest (peak), trough, amplitude and wave speed
- 4 Recall and use the equation for wave speed
 $v = f\lambda$
- 5 Know that for a transverse wave, the direction of vibration is at right angles to the direction of propagation and understand that electromagnetic radiation, water waves and seismic S-waves (secondary) can be modelled as transverse

*continued***Core****Supplement**

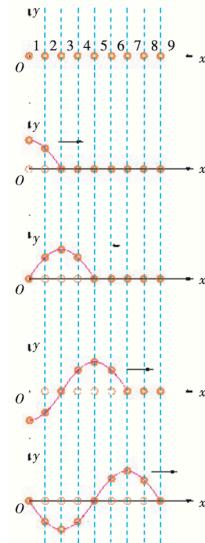
- 6 Know that for a longitudinal wave, the direction of vibration is parallel to the direction of propagation and understand that sound waves and seismic P-waves (primary) can be modelled as longitudinal
- 7 Describe how waves can undergo:
 - (a) reflection at a plane surface
 - (b) refraction due to a change of speed
 - (c) diffraction through a narrow gap
- 8 Describe the use of a ripple tank to show:
 - (a) reflection at a plane surface
 - (b) refraction due to a change in speed caused by a change in depth
 - (c) diffraction due to a gap
 - (d) diffraction due to an edge
- 9 Describe how wavelength and gap size affects diffraction through a gap
- 10 Describe how wavelength affects diffraction at an edge

14.1 Wave motion

What are waves?



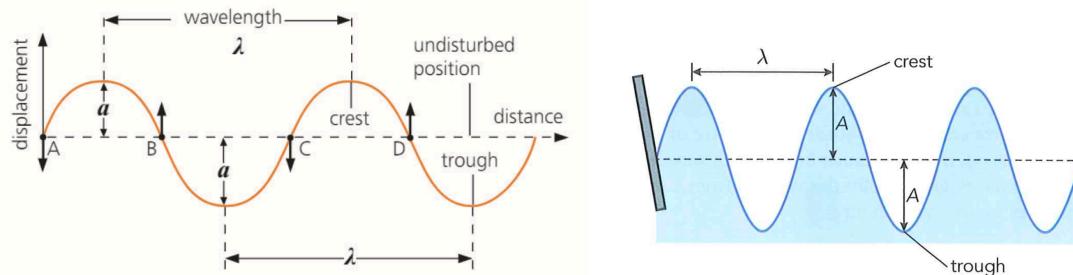
How wave formed in the rope:



How do we describe waves in physics? What physical quantities do we use?

14.2 Wave quantities (Wave model)

1. Displacement-distance graph (波形图)



Wave at a particular _____ moves up and down at different _____.

Wavelength λ :

unit:

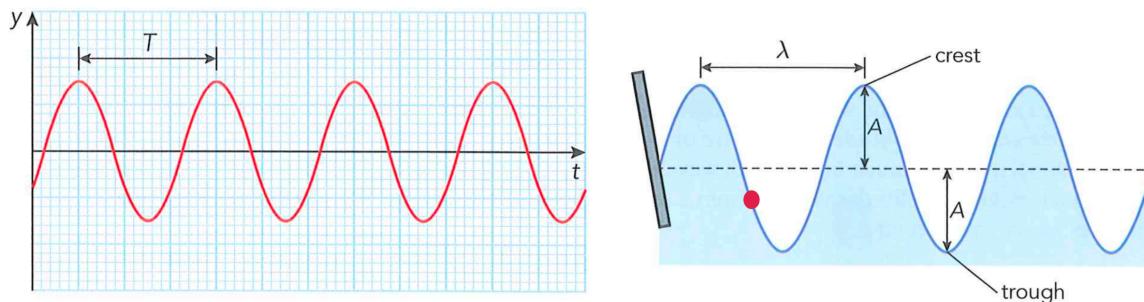
Amplitude A :

unit:

Phase

Wavefront:

2. Displacement-time graph (振动图)



Wave at a particular _____ moves up and down as time passes.

Period T :

unit:

Frequency f :

unit:

3. Wave speed:

E.g. the speed of the crest of a ripple traveling over the surface of the water

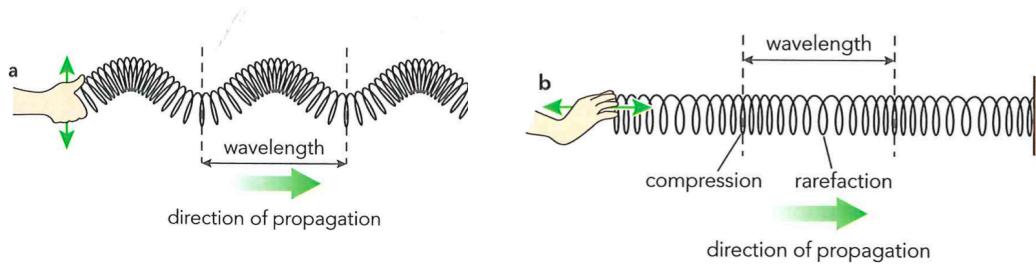
Equations:

unit:

Exercise

An FM radio station broadcasts signals of wavelength 1.5 meters and frequency 20MHz. What is their speed?

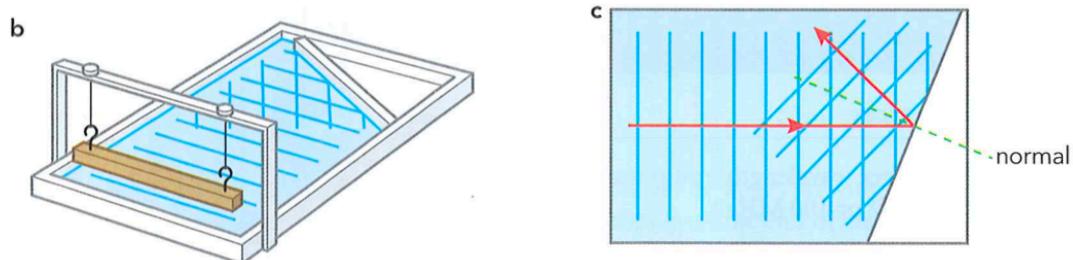
14.3 Transverse wave vs Longitudinal wave

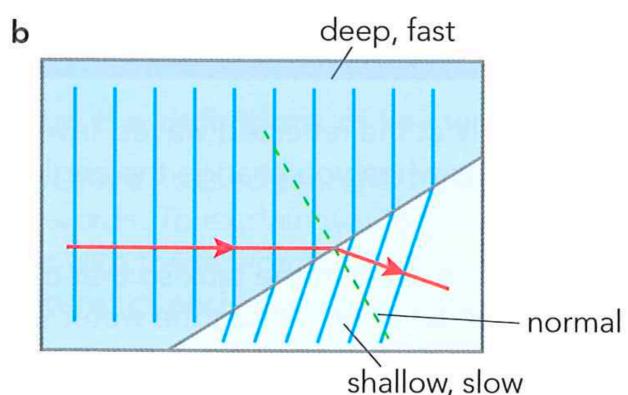
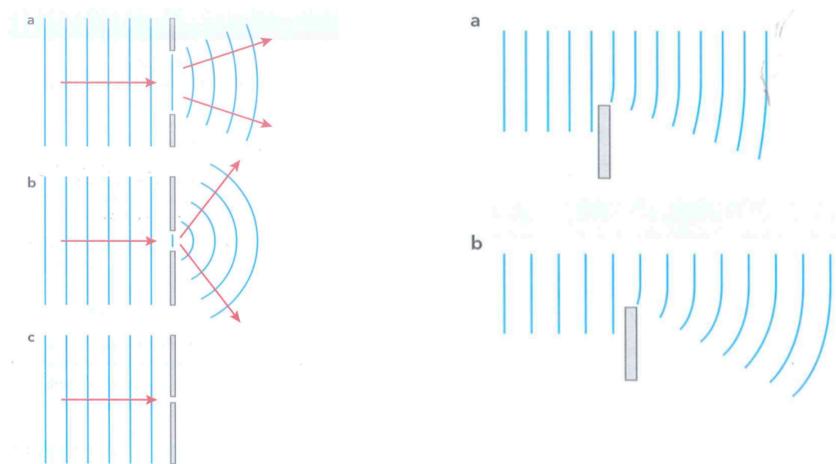


Transverse waves	Longitudinal waves
ripples on water	sound
light and all other electromagnetic waves	primary seismic waves (P-waves)
secondary seismic waves (S-waves)	

14.4 Wave phenomena

reflection



Refraction**Cause:****Diffraction:**

Diffraction effect is **greatest** when the size of the gap or the object _____

14.5 Waves and energy

Alternatively, we can think of wave speed as the speed at which _____

Sun: light wave and infrared wave(radiation); sun -> earth

Loudspeaker: sound wave; source -> ear

Large amplitude (bright light/loud sound) ->

