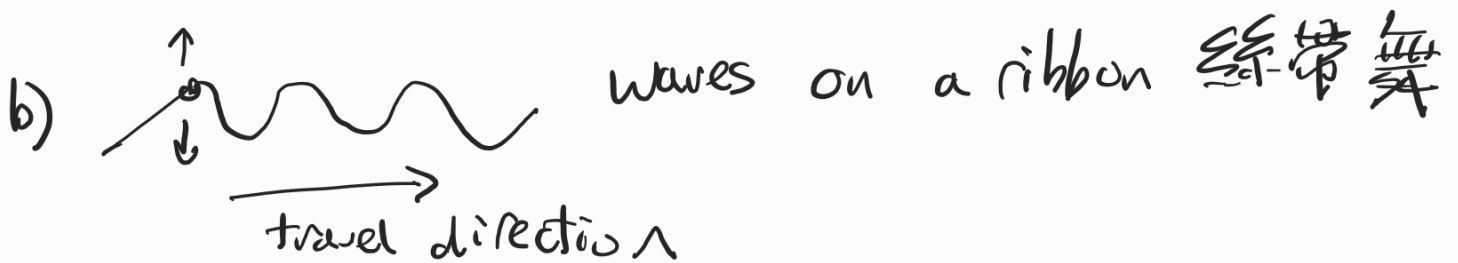
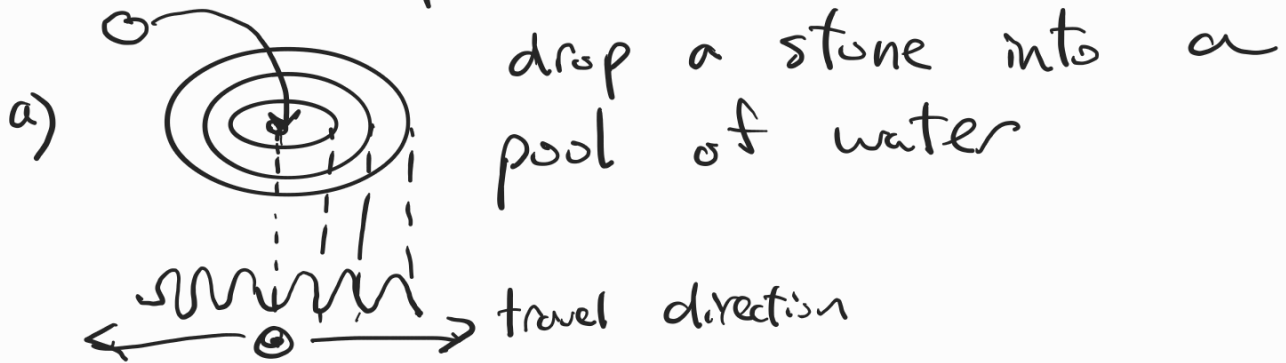


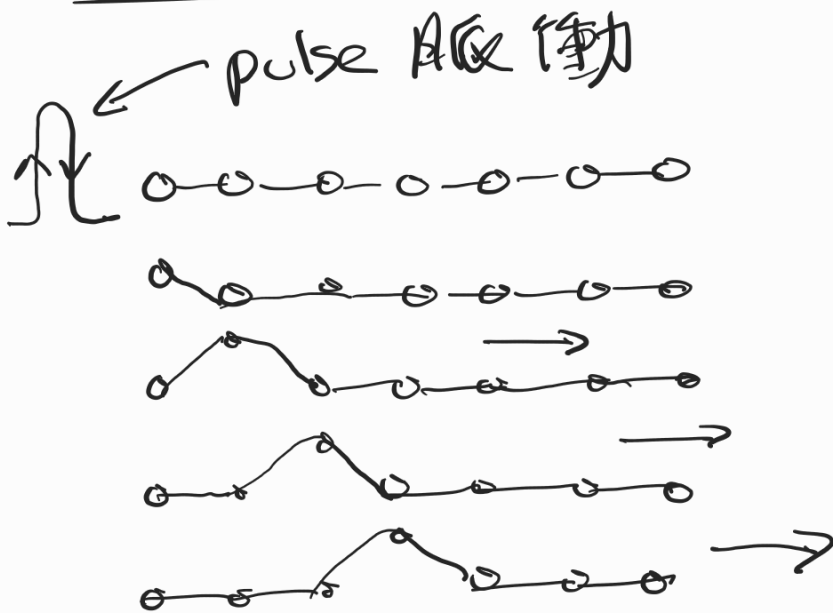
3.1 WAVE MOTION

(波) (動)

Waves examples



Oscillation 振盪 (or vibration)



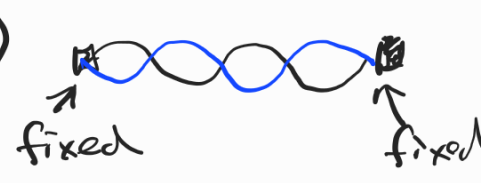
all waves are produced by vibration

travelling direction of wave

(行波)

Travelling waves transmit energy but not matter

Travelling waves vs Stationary waves

example: water wave (travelling) 
guitar string (stationary) 

Mechanical Wave vs Electromagnetic Wave

mechanical: water wave, sound wave - needs ^{↑ 質} medium to travel
electromagnetic: light, radio waves - can travel through vacuum

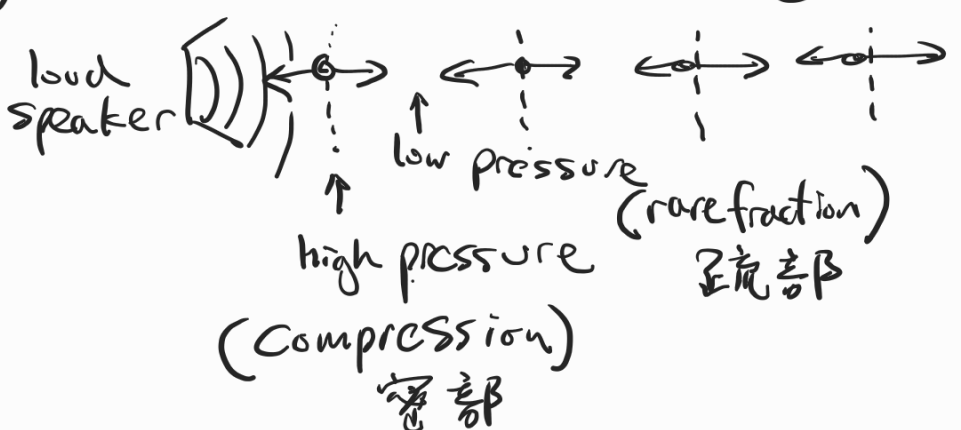
Transverse waves vs Longitudinal waves

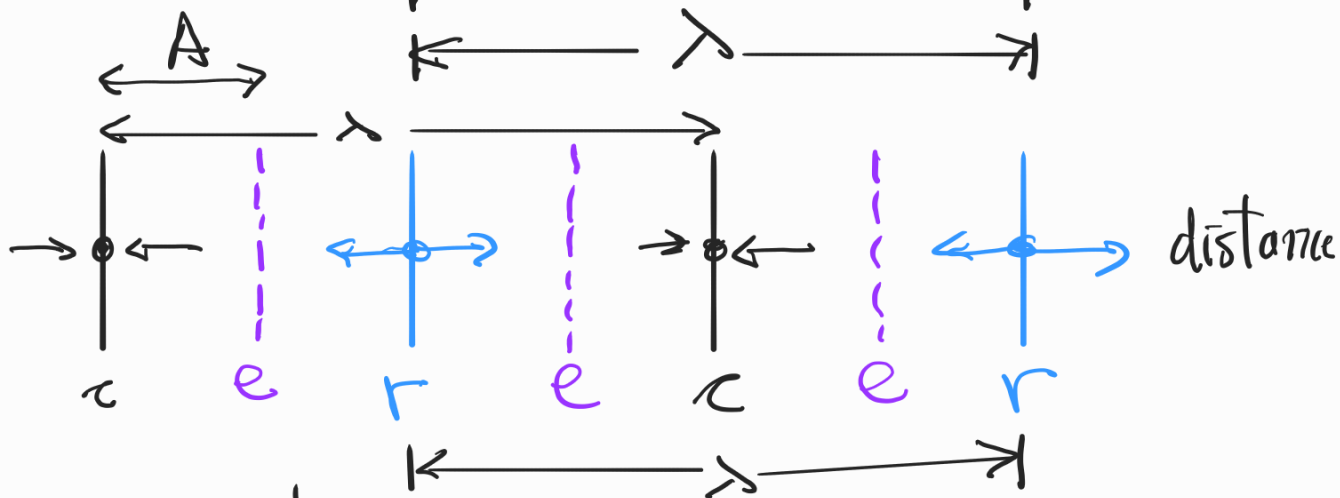
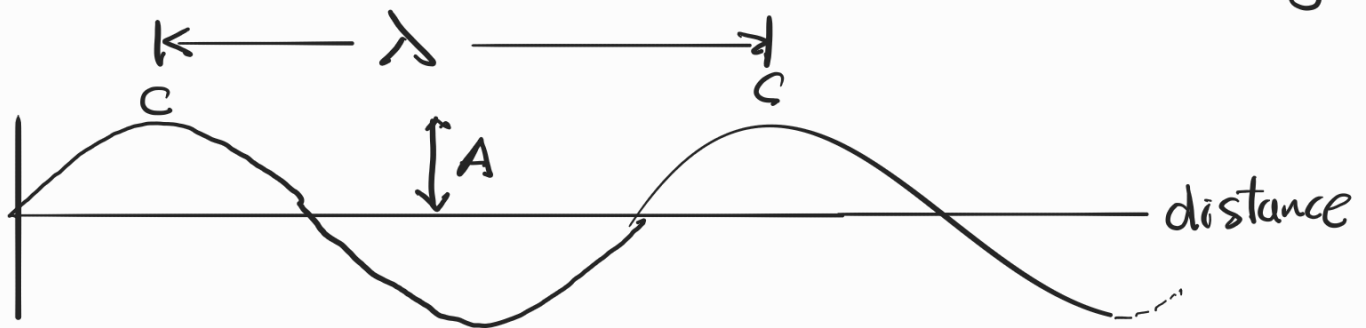
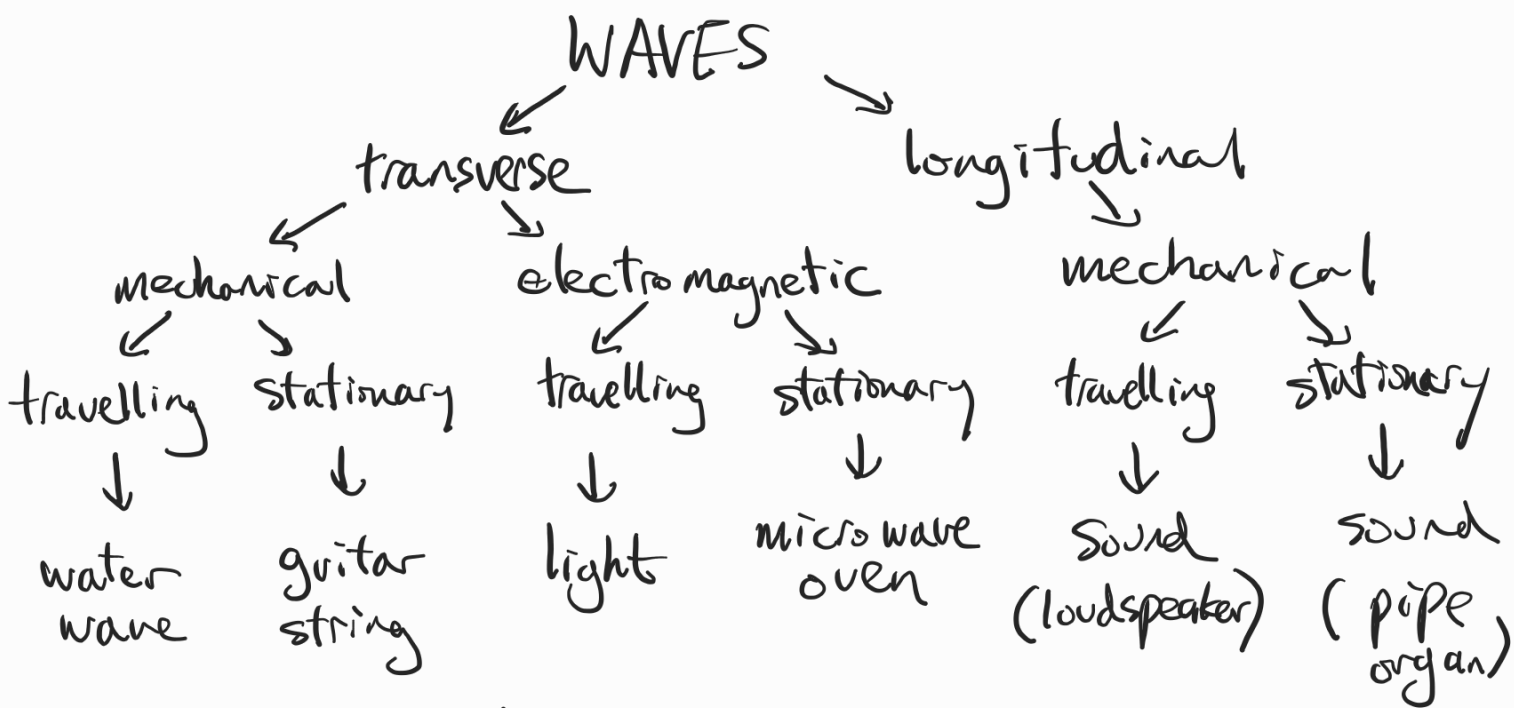
橫波

縱波

Transverse: Direction of oscillation is ⊥ to travel direction


Longitudinal: Oscillation is along wave's travel direction


travel direction



C: Crest 波峰

T: Trough 波谷

C: compression 密部

r: rare fraction 疏部

A: Amplitude

λ : wavelength

PERIOD (周期) T vs

FREQUENCY (频率) f

time needed to produce one complete wave
unit: s

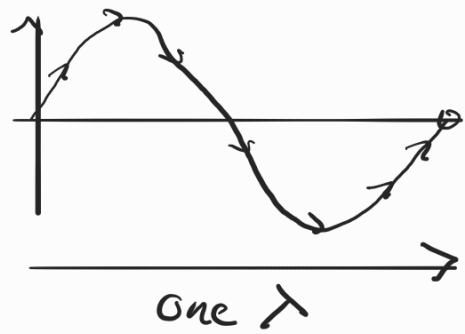
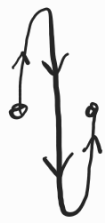
$$T = \frac{1}{f}$$

number of completed waves in one second
unit: $\frac{1}{s}$, Hz 赫兹

WAVE SPEED (波速) $v = \frac{\lambda}{T} = f\lambda$

distance travelled by a wave per unit time

Transverse
Motion
(one period)

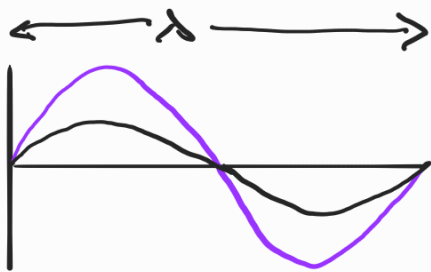


distance

one λ

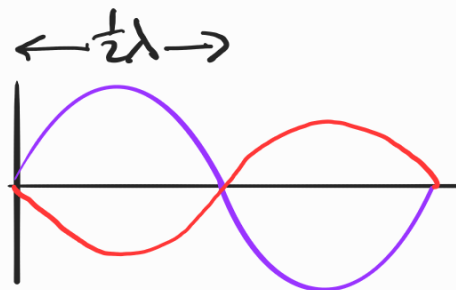
example: $\lambda = 2\text{m}$ $f = 2\text{Hz}$ $v = f\lambda = \underline{\underline{4\text{ms}^{-1}}}$

PHASE (相位)



Inphase (同相)

[when 2 waveforms
are one wavelength apart]

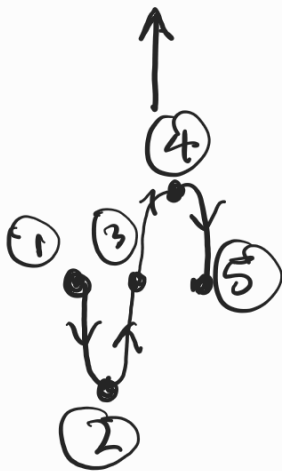
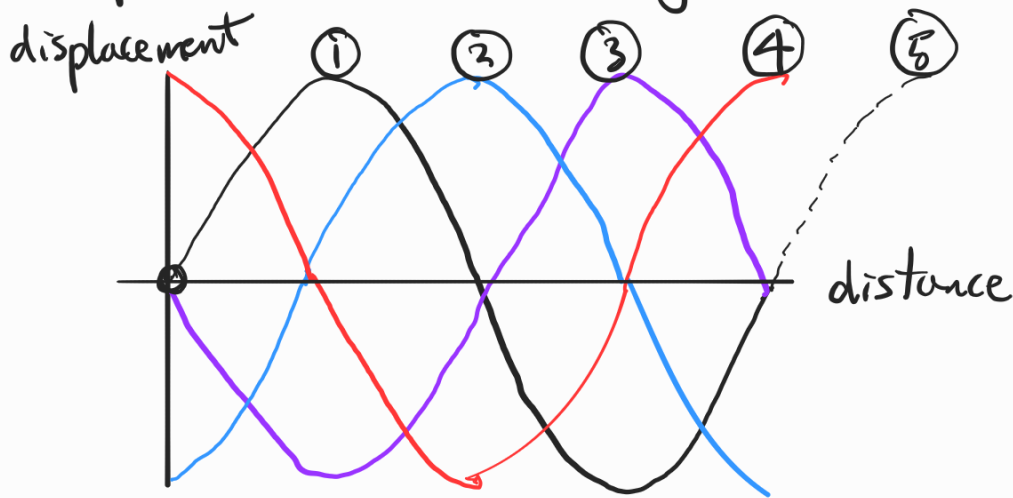


Anti phase (反相)

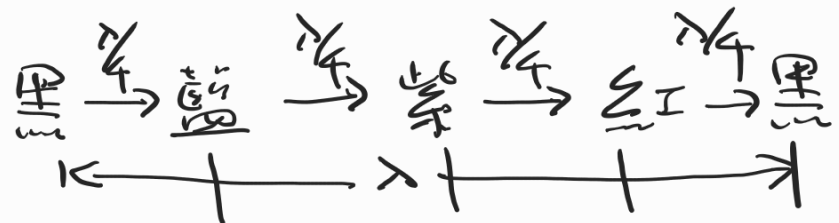
[when 2 waveforms are
half a wavelength apart]

Displacement - distance graph

(s - d)

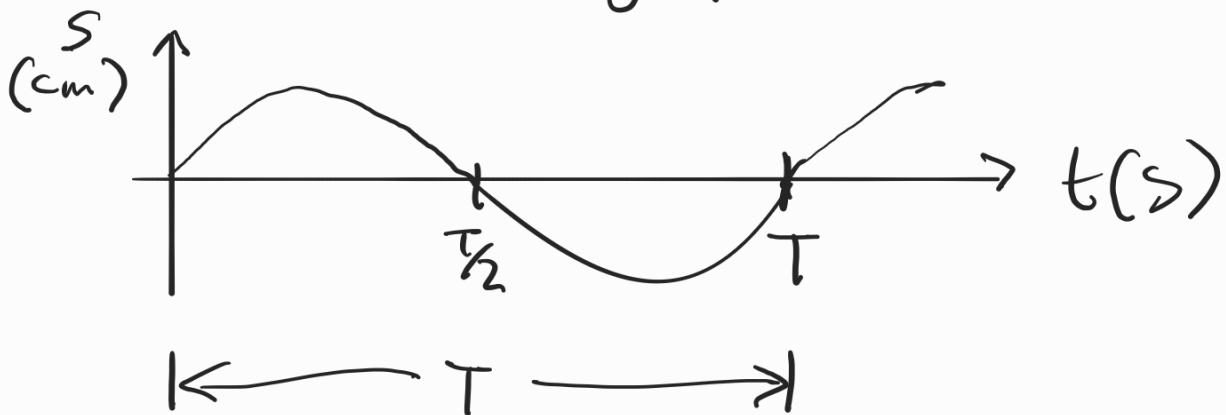


} one cycle of oscillation



Distance - Time graph

(s - t)



one period

