ANTENNA AND WAVE PROPAGATION

I. Characteristics of Waves

- Waves
- Transverse waves
- Longitudinal waves
- Measuring waves

A. Waves

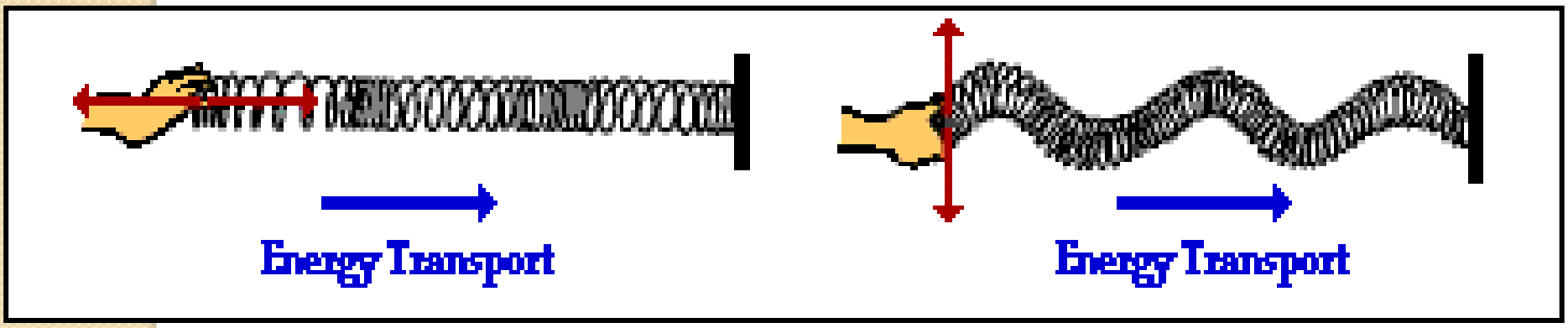
- **Waves**
  - rhythmic disturbances that carry energy through matter or space
- **Medium**
  - material through which a wave transfers energy
  - solid, liquid, gas, or combination
  - electromagnetic waves don't need a medium (e.g. visible light)

A. Waves

- **Two Types:**

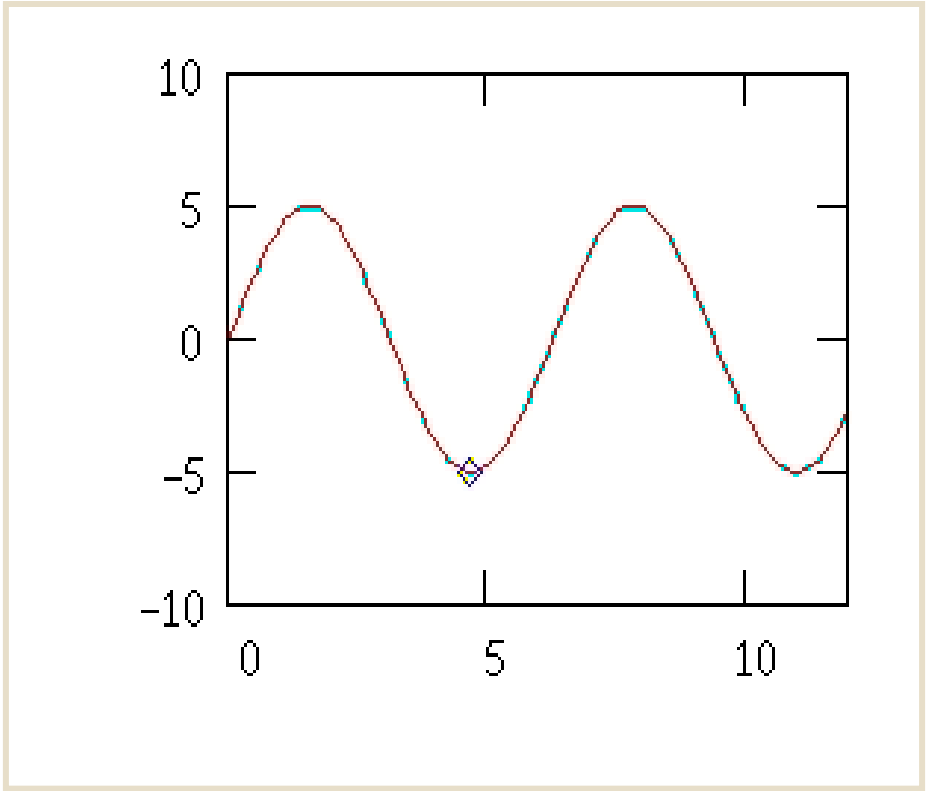
Longitudinal

Transverse



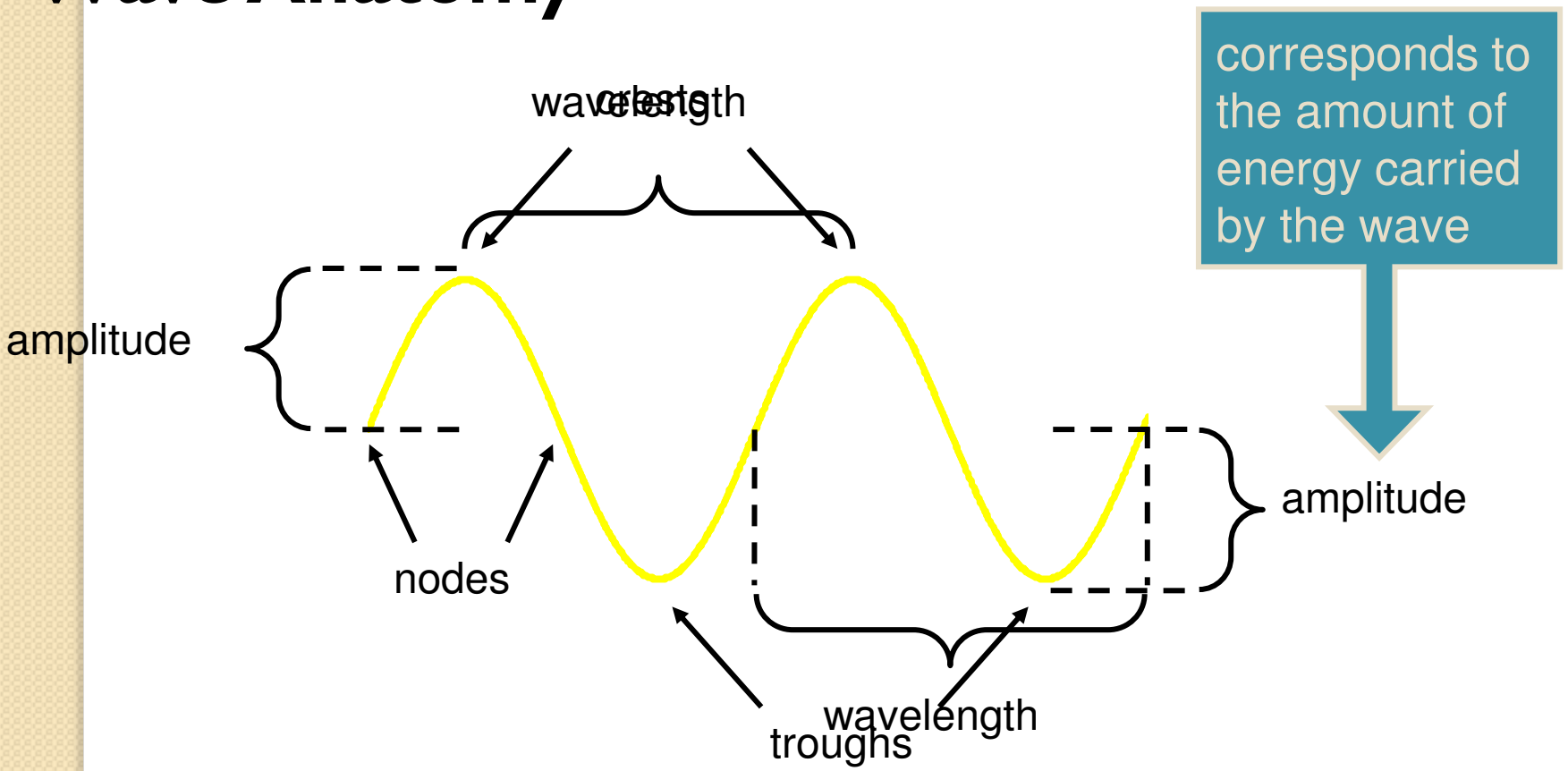
B. Transverse Waves

- **Transverse Waves**
  - medium moves perpendicular to the direction of wave motion



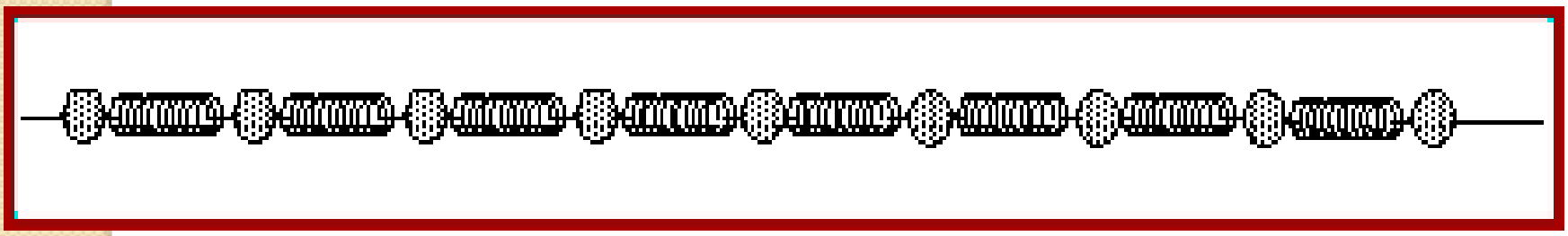
B. Transverse Waves

- **Wave Anatomy**



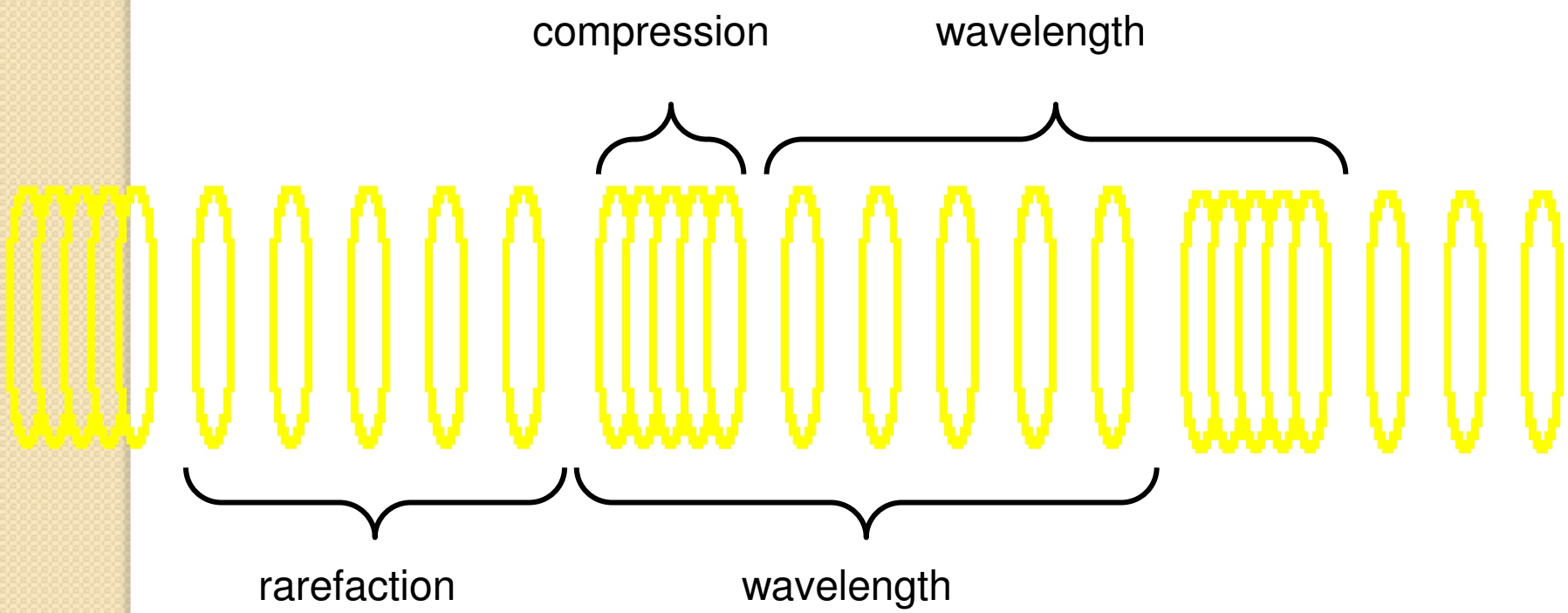
C. Longitudinal Waves

- **Longitudinal Waves** (a.k.a. compressional)
  - medium moves in the same direction as wave motion



C. Longitudinal Waves

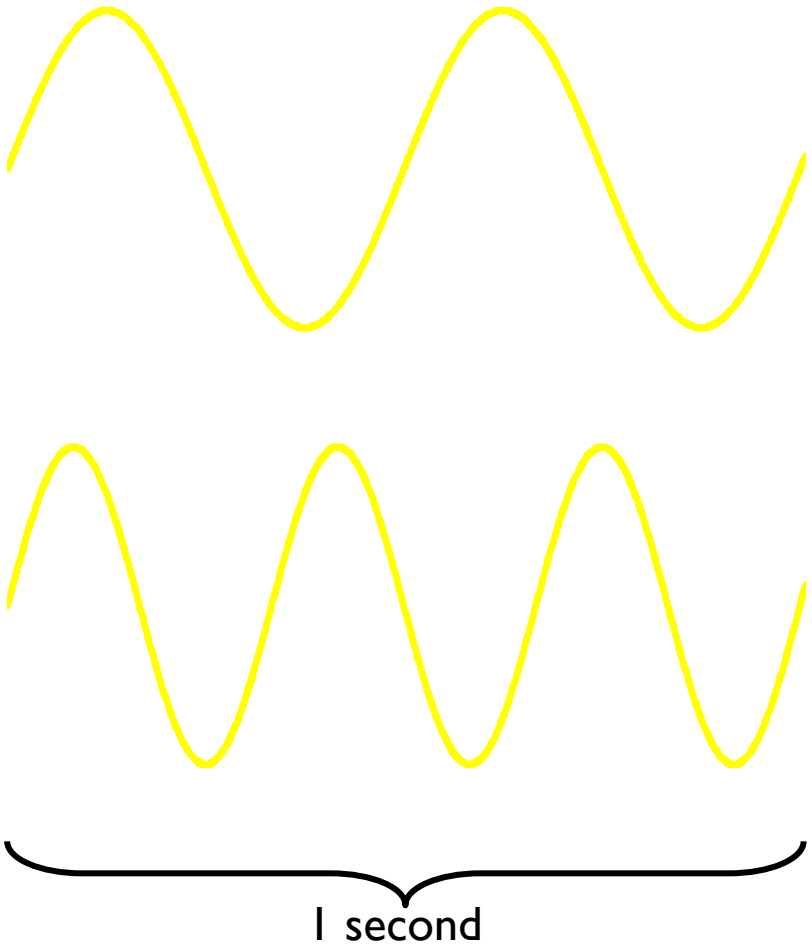
- **Wave Anatomy**



Amount of compression corresponds to amount of energy ≈ AMPLITU

D. Measuring Waves

- **Frequency** (f)
  - # of waves passing a point in 1 second
  - Hertz (Hz)



- shorter wavelength $\Rightarrow$ higher frequency $\Rightarrow$ higher energy

D. Measuring Waves

- **Velocity** ***(v)***
  - speed of a wave as it moves forward
  - depends on wave type and medium

$$v = \lambda \times f$$

v: velocity (m/s)

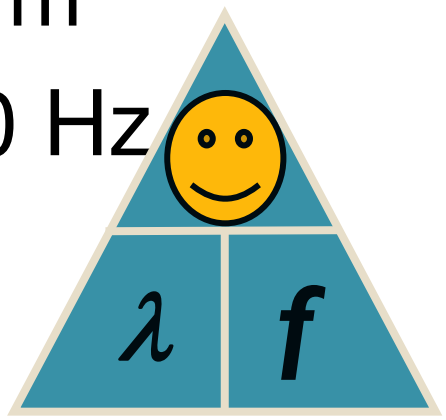
λ: wavelength (m)

f: frequency (Hz)

D. Measuring Waves

- EX: Find the velocity of a wave in a wave pool if its wavelength is 3.2 m and its frequency is 0.60 Hz.

GIVEN:	WORK:
v = ? λ = 3.2 m f = 0.60 Hz	$v = \lambda \times f$ v = (3.2 m)(0.60 Hz) **v = 1.92 m/s**



D. Measuring Waves

- EX: An earthquake produces a wave that has a wavelength of 417 m and travels at 5000 m/s. What is its frequency?

GIVEN:	WORK:
$\lambda = 417$ m $v = 5000$ m/s $f = ?$	$f = v \div \lambda$ $f = (5000 \text{ m/s}) \div (417 \text{ m})$ $f = 12$ Hz