# 8.1 - What is a Vibration?

p. 380 # 1, 3, 4, 5

(1) Vibration ⇒ can also be called an oscillation or repetitive pattern of an object.
ie: swinging pendulum or drum skin moving.

Wave ⇒ is the transfer of energy.
Often moves in straight line ⇒ there is no oscillation.

(3) Medium properties
- Molecular & Mechanical structure
- density
- temperature
- elasticity needed

} all effect ability to transmit waves.

example
• Materials that are rigid transmit waves more efficiently than non-rigid.

solid ← liquid ← gas
← speed of transmission

(4) vibration → waves
- hitting a drum → sound wave
- strumming guitar string → sound wave
- rock vibrations → earthquake wave

# 8.2 Types of Mechanical Waves

#4, 6, 7, 8 Pg 384

#4. A stadium wave can be considered a transverse wave. Mechanical waves require a medium and in this case the medium is the fans.
One difference that could be noted is that the fans have to think and consciencticuely stand up & sit down. Particles in a mechanical wave do not "think"; they are given energy to oscillate.

#6. A mechanical wave requires a medium in order to transmit energy. Sound is created when air particles oscillate parallel to the direction of the sound travelling. Air particles are the medium ∴ sound is a mechanical wave.

#7. Anything really.

Benefits of sound

→ Music!

→ radio / T.V. / movies

→ hear thunder - take cover

hear cars/ambulances in street

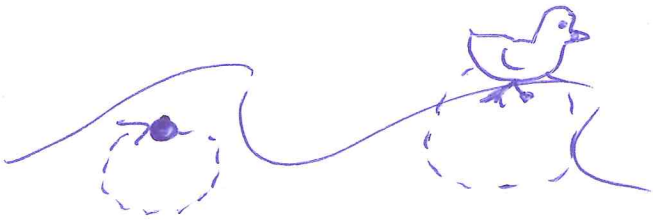
→ hear wind/rain ⇒ lovely

Think of what you'd miss without sound.

#8. Complex wave = longitudinal + transverse

&

⊙ Water waves

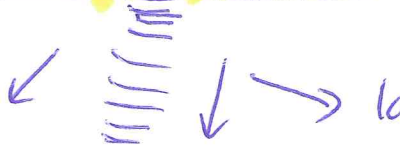


- the path of one water particle is circular so ↕ plus ↔. Watch something that floats and it will follow a circular path.

⊗ Best example

⊙ hammered surface

transverse - See the highlighted area. This is how it starts



longitudinal wave (wood compressed)

# 8.4 Determining Wave Speed

p. 387 #3

p. 391 #1, 2, 3, 4, 7

p. 387 #3

$v = 405$ m/s

$\lambda = 2.0$ m

$f =$

$$v = f\lambda$$

$$f = \frac{v}{\lambda} = \frac{405}{2} = 202 \text{ Hz}$$

p. 391

① $v = 123$ m/s $\quad \lambda = ?$

$f = 230$ Hz

$$v = f\lambda$$

$$\lambda = \frac{v}{f} = \frac{230}{123} = 1.9 \text{ m}$$

② $F_T = 37$ N $\quad v = ?$

$\mu = 0.03$ g/m $= 0.00003$ kg/m *

$$v = \sqrt{\frac{F_T}{\mu}} = \sqrt{\frac{37}{0.00003}} = 1.1 \times 10^3 \text{ m/s}$$

(3) $T = 1.20 \times 10^{-3}$ s

$v = 3.40 \times 10^{2}$ m/s

$\lambda = ?$

$v = f\lambda$ ✓ ?

$f = \frac{1}{T} = \frac{1}{1.2 \times 10^{-3}} = 833$ Hz

$\lambda = \frac{v}{f} = \frac{3.40 \times 10^{2}}{833} = \underline{0.41 \text{ m}}$

(4) P-waves  solids + liquids

S-waves  solids only

$d = 2400$ km $\quad v_p = 8.0$ km/s

$t = ?$ $\quad v_s = 4.5$ km/s

a) $t = \frac{d}{v}$ P → 2400 km / 8.0 km/s = 300 s (÷60) = $\underline{5 \text{ min}}$

S → 2400 km / 4.5 km/s = 533 s (÷60) = $\underline{8.9 \text{ min}}$

b) Secondary → because they arrive after primary.

c) Secondary cannot go through liquid core of Earth so it helps define where liquid core is

(7) $v = \sqrt{\frac{F_T}{\mu}}$ $\therefore v \propto \sqrt{F_T}$

I want to <u>double</u> speed

$\therefore \sqrt{F_T} = 2$

$\therefore F_T = 4$

TRY

A $F_T = 1$ $\mu = 1$

B $F_T = 4$

(A) $v = \sqrt{\frac{1}{1}}$ $v = 1$

(B) $v = \sqrt{\frac{4}{1}}$ $v = 2$

doubled!

# 8.5 – Properties of Sound p. 397

IF 2, 3, 5, 6.

2. M = 2

Mach is how fast a plane is flying relative to the speed of sound at that same spot.

So "Mach 2" means plane is flying <u>twice</u> (2x) speed of sound.

3. M = 0.83

T = 10°C

v = ? (km/h)

$v_{sound} = 331.4\ m/s + 0.606(10)$

$= 337\ m/s$

$$M = \frac{\text{speed of object}}{\text{speed of sound}}$$

$$0.83 = \frac{\text{speed of object}}{337}$$

$$\text{speed of object} = 280\ m/s \times \frac{1\ km}{1000\ m} \times \frac{3600\ s}{1\ h}$$

$$= \underline{1000\ km/h}$$

5. Sound intensity = it's like the density of sound energy

ie: amt sound energy / $m^2$

Loudness = is about how we humans perceive (ears/brain) sound energy.

decibal (dB) = a more convenient unit of sound intensity. It is on a logarithmic (exp. of 10) scale.

6. Loudness ⇒ usually reported in decibels because this scale is more convenient than $W/m^2$

Sound Barrier – p. 398-399 #1, 2, 3.

This is a reading exercise.
You can find the answers.