Phys 1240: Sound and Music
www.colorado.edu/physics/phys1240

LAST: waves and sound
TODAY: waves and SHM
NEXT: resonance and instruments
READ: 3.2-3.3
(New CAPA is out)
Remember help room hours and problem solving sessions!

CT1.3.xx

If a big collision occurs in deep, empty outer space (two asteroids small into one another, surrounded by “vacuum”),

Does it make a sound?

A) Sure
B) Sure (if there’s an astronaut there to hear it)
C) No.

“In space no one can hear you scream” (“Alien” ads, c. 1979)

CT 2.1.6

Speed = wavelength*frequency
\[ v = \lambda f \]

The air warms up by 20° C. It turns out that this instrument (like most wind instruments) produces sound waves of a particular wavelength.

So, changing the temperature will not change the wavelength of sound waves produced by this instrument (noticeably.)

What will change?

a) Frequency
b) Speed
c) Both
d) Neither
e) ??

CT 2.1.7

We know that pressure changes (as time goes by) for sound waves.

What changes (as time goes by) for gentle water waves on a pond?

a) The water density
b) The water temperature
c) The water level or height
d) The water molecules’ position in the direction of wave propagation
e) Nothing about water waves vary with time
CT 2.1.8

Looking at the following waveform, what is the period?

Amplitude

1 2

time (sec)

a) 1 sec
b) 2 sec
c) 1 m/s
d) 2 m/s
e) Not enough information

CT 2.1.9

Looking at that same wave (shown again below), what is its speed?

Amplitude

1 2

Time (sec)

a) 1/2 m/s
b) 2 m/s
c) 5 m/s
d) 20 m/s
e) Not enough information

Now given that $\lambda=10$ m what is the speed of the wave?

CT 2.1.10

The wavelength, $\lambda$, is 10 m. What is the speed of this wave?

Amplitude

1

Time (sec)

a) 1 m/s
b) 7 m/s
c) 10 m/s
d) 15 m/s
e) None of the above/not enough info?

CT 2.2.1

An oscilloscope presents a graphical representation of:

a) Amplitude vs. Position
b) Wavelength vs. Time
c) Voltage vs. Position
d) Voltage vs. Time
e) Wavelength vs Amplitude
What is the period of this wave?

- a) $t_1$
- b) $t_2$
- c) Not at all defined
- d) Not well defined, but $t_1$ is the best answer
- e) Not well defined, but $t_2$ is the best answer

What is the period?

- a) $t_1$
- b) $t_2$
- c) $t_2-t_1$
- d) $t_3-t_1$
- e) None of the above

**Simple harmonic motion**

"Harmonic" motion: periodic

If the force pulling you back doubles when you stretch twice as far

=> SIMPLE harmonic motion

"Harmonic" motion: periodic

If the force pulling you back grows linearly with how far from equilibrium you are

$\Rightarrow$ SIMPLE harmonic motion
Which of the following is necessary to make an object oscillate?

i. A stable equilibrium
ii. Little or no friction
iii. A disturbance

a) i. only
b) ii. Only
c) iii. Only
d) i and iii only
e) all three

Given the above, will the motion be “Simple Harmonic Motion”?

springs

Mass on an (ideal) spring is “SHM” (simple harmonic…)
The frequency is completely determined** by the

• Mass (m)
• Spring stiffness (K)
  (bigger K means more stiff)

** the Amplitude does not matter!!

Freq. = (constant) * √(K/m)

Does this make sense?

What if mass is greater?
… spring is floppier? (smaller K)

A  doubles
B: increases by 4
C: halves.
D: decreases by 4
E: None of these/not sure

What happens to the period?