IF YOU MISSED THE ORGAN DEMONSTRATION

Quiz ### *(Counts Double)* Due: November 21, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

In place of the organ recital/demonstration, please do the following.
(Note, you can do EITHER the organ demo or the assignment, but NOT BOTH!)

Choose a large well known campus performance room
(Perkins Chapel, Bob Hope Auditorium, O'Donnell Hall, etc.,).

Your mission is to make an accurate acoustical assessment of the room.
Include the following items.
(I expect this will take you about 2 hours to do a good job and get full credit.)

- Compute the total volume of the room.
- Compute the total surface area of the room.
- Itemize the types of wall/floor/ceiling coverings, and compute the effect to these items.
- Compute the reverberation time of the room for f=1000Hz.
- Based on this value, estimate the reverberation time of the room for f=100Hz and f=10,000Hz. Comment on differences.
- IMPORTANT: Evaluate the room for acoustical problems. Identify potential problems such as hi/lo frequency loss, echos, intimacy, etc.
- IMPORTANT: Include other comments or observations about the design of the room.

NAME:

Quiz #1 August 26, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1)True or False:

a. T / F : It is not necessary to do a pre-lab before the lab session.

b. T / F : Class will always be in Fondren Science and never in Perkins Chapel or the Meadows building for special presentations.

c. T / F : The quiz grading scheme is as follows:

# Correct	*Score*
3	3
2	3
1	2
0	1
absent	0

... so that you can always miss one question without penalty.

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2) True / False:

In lab, there is plenty of time to carefully read the lab procedure and workout the pre-lab problems during the start of the lab period; therefore, you don't have to begin the experiments until the last 5 minutes of the period.

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3) Identify the 3 fundamental physical quantities from which all other are built up.

a. length, distance, breadth
b. speed, velocity, motion
c. mass, weight, slugs
d. money, power, mass-media
e. earth, wind, fire
f. length, time, mass

Hints for Quiz #2: This will be on the video (online linked from the webpage). What was the point of the Tchaikovsky demonstration? What is the trick to reproducing the Stradivarious? When you change the shape of the carillon bells, what happens?

NAME:

Quiz #2 August 28, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

Circle the correct answer for each problem.

1) The revolutionary breakthrough described in the video that allows us to make violins that sound like antique Stradivarius violins came from the observation that the wood was aged in water, therefore ... *(what was the key difference???)*

2) What was the point of the demonstration of the orchestra playing Symphony No.6 of Tchaikovsky??? Why did they stand up and move??

(Just convince us you got it.)

3) What is the MUSICAL different about the "new bells" demonstrated in the video??? *(Just convince us you got it; there could be multiple answers.)*

NAME:

Quiz #3 September 2, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1) 2) SMU installs a speaking tube 7,000 meters (7 km) long so the students can listen to the lecture without leaving their apartments downtown. How long does it take a sound wave to travel the length of the tube? (Assume v=350m/s)
Useful formula: x = v t

2) What is the wavelength (λ) of the note A=440 Hz. (Assume v=350m/s)
Useful formla: v = f λ. Take v=350m/s and f= 440. Compute λ.

3) The speed of sound is aproximately 350 meter/second. Convert into miles/hour.
(Remember, 2 out of 3 correct answers gives you full credit on the quiz.)
The following might be useful: 1,000 meters = 1 km, 1 mile = 1.6 km,
1 minute = 60 seconds, 1 hour = 60 minutes.

I suggest you fill in the blanks [???] below

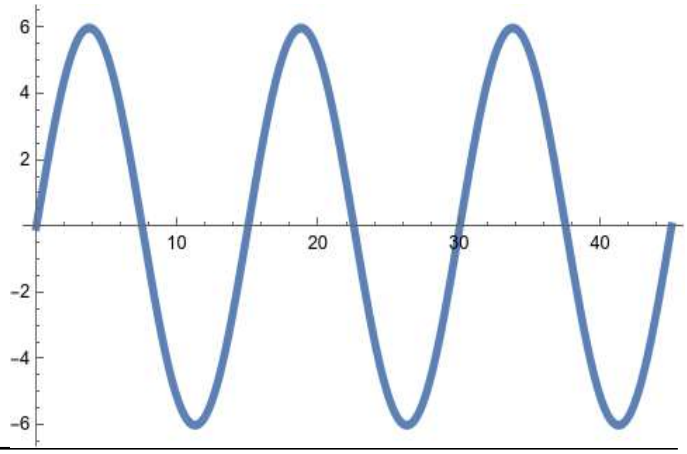
$$\left[350\frac{meters}{second}\right] \times \left[\frac{???}{???}\frac{seconds}{minutes}\right] \times \left[\frac{???}{???}\frac{minutes}{hours}\right] \times \left[\frac{???}{???}\frac{kilometers}{meters}\right] \times \left[\frac{???}{???}\frac{miles}{kilometers}\right] = \left[\frac{???}{???}\frac{miles}{hr}\right]$$

NAME:

Quiz #4 September 4, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1) The figure represents a sound wave as displayed on an oscilloscope.
The horizontal axis is in **seconds**, and the vertical axis is in **meters**.
From the figure, find the following, AND INDICATE UNITS!!!
Hint: T=1/f



a) period

b) frequency

c) amplitude
(careful!!!)

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2) What is the frequency (f) of the note that has a wavelength of 1 meter.
(Assume v=350m/s) Useful formla: v = f λ. λ= 1 meter. Compute f.

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3) a) For a pendulum, the frequency $\frac{1}{2\pi}\sqrt{\frac{g}{L}}$ is independent of two quantities:

_____ and _____

b) For a mass on a spring, the frequency $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ is independent of:

_____

c) Why is $\frac{1}{2\pi}\sqrt{\frac{k}{m}}$ important for music???

NAME:

Quiz #5 September 9, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

Circle the correct answer for each problem.

1)For a TRANSVERSE wave the displacement is _____ relative to the motion of the wave

For a LONGITUDINAL wave the displacement is _____ relative to the motion of the wave

Sound waves are (chose one) TRANSVERSE / LONGITUDINAL

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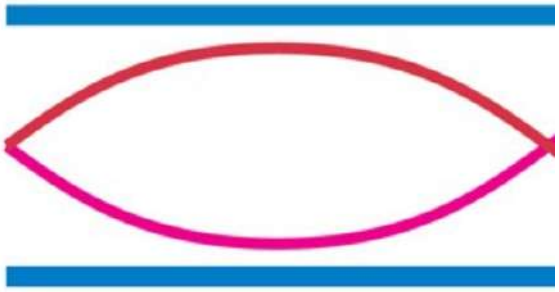
2 & 3) For an open organ pipe, sketch the wave pattern for the lowest frequencies is shown.



2) The length of the organ pipe is L=3 meters, find the wavelength of the sound.

$\lambda =$

3) Given v=340m/s, and using $v=f\lambda$, find the frequency $f=v/\lambda$.

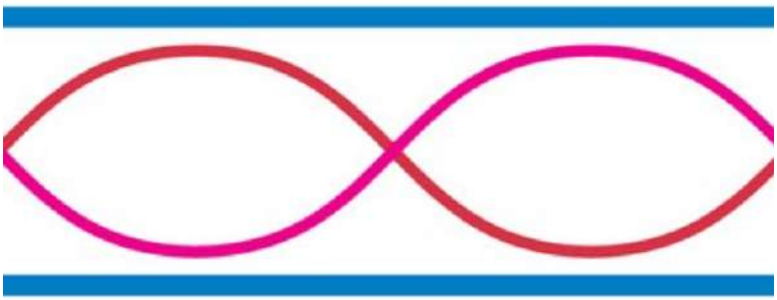
f =

NAME:

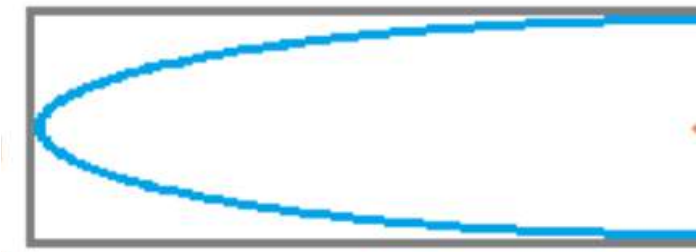
Quiz #6 Sept 11, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1) For an open organ pipe, the wave pattern for the 2nd harmonic is displayed. If f=440 Hz, and v=340m/s, compute the wavelength λ. Recall: $v=f\lambda$.



2) For an closed organ pipe, the wave pattern for the lowest frequencies is shown. If L=1 meter, v=340m/s, find the frequency f in Hz. Recall: $v=f\lambda$.



3)For a vibrating mass—spring system, the book shows: thus:

$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$

a) when the mass **H** increases the frequency goes: UP / DOWN / No Change

b) when the spring **i** increases the frequency goes: UP / DOWN / No Change

c) when the amplitude **n** increases the frequency goes: UP / DOWN / No Change

NAME: _____

QUIZ #7 September 16, 2025

Physics 1320 Music & Physics Prof. Olness & Baker

Circle the correct answer for each problem.

1. The resonant pitch of a Helmholtz Resonator depends on which of the following factor/s?

a) volume of the cavity
b) length of the neck
c) area of the opening of the neck
d) all the above

2a. The Hammond organ uses drawbars to control the intensity (loudness) of the sine waves of the harmonic series. T or F

2b. The Leslie speaker uses the Doppler effect to create its vibrato effects. For most listeners, this effect is barely noticeable. T or F

3a. Organ pipes are usually made from metal or wood. T or F

3b. The pitch/frequency of a FLUE organ pipe cannot be changed once the pipe is built. T or F

NAME:

Quiz #8 Sept 18, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

Waves do 4 things. Describe each and give an example. *(Pictures help.)*

R_____

R_____

I_____

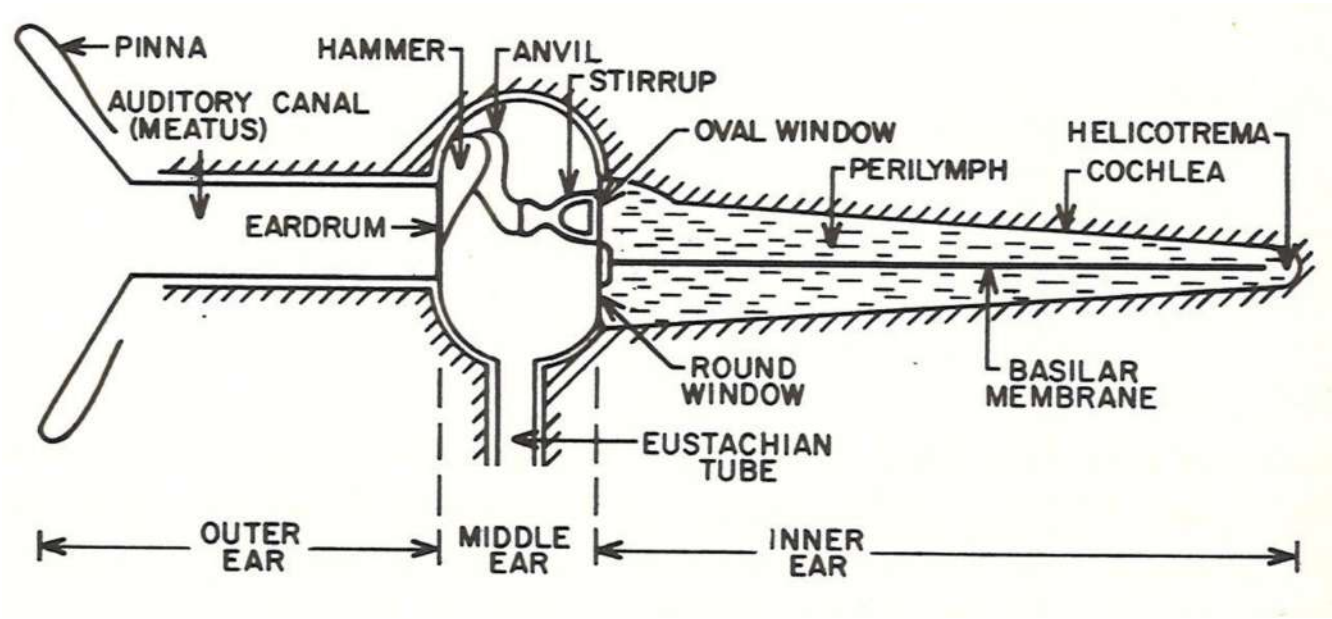
D_____

NAME:

Quiz #9 September 23, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

For the ear, discuss what happens from the point at which a sound wave enters the outer ear to the point at which the sound "message" leaves the inner ear and heads to the brain.



Outer ear:

Middle ear:

Inner ear:

0 point bonus: Fall began yesterday. Why do I notice this when driving East/West?

NAME:

Quiz #10 September 25, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1a) If 1 trumpet player has SIL of 70dB, what is the SIL of 2 players?

1b) If 1 trumpet player has SIL of 70dB, what is the SIL of 4 players?

2a) If 1 clarinet player has SIL of 60dB, what is the SIL of10 players?

2b) How many clarinet player does it take to increase the SIL by 20dB??

3) At the quad concert, the dB level 1.0 meter from the speakers is 100dB. If I double my distance to 2.0 meters, applying the inverse-square law, my distance goes up by a factor of 2, **[choose up/down below]**

so my intensity goes up/down by a factor of _____,

and thus my dB level goes up/down by _____ dB

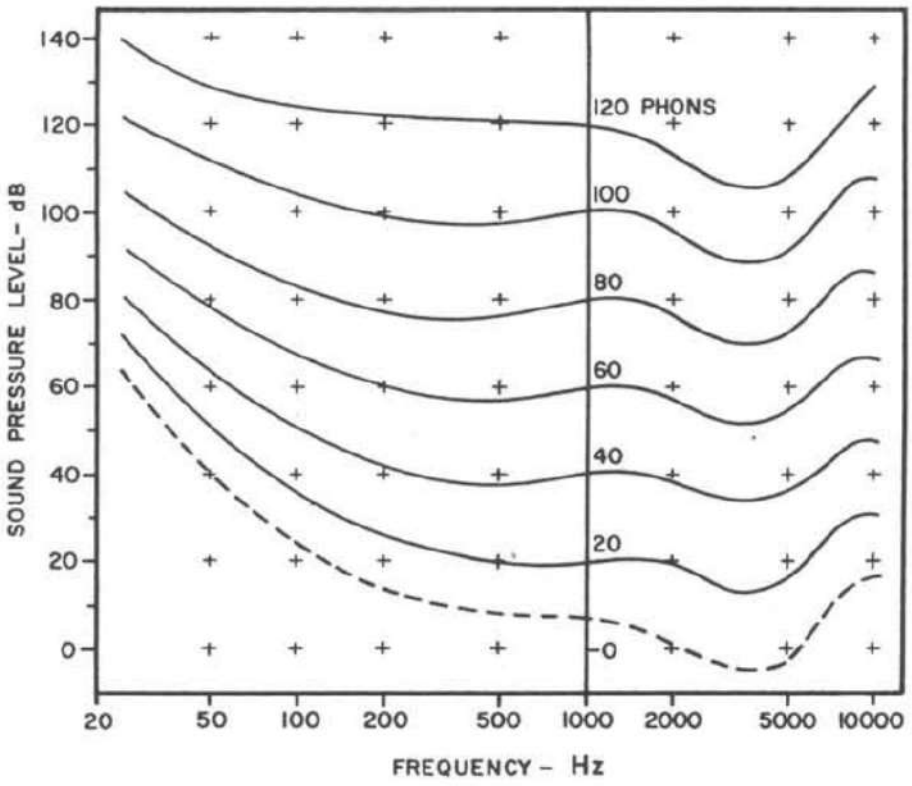
and my final dB level is _____ dB

NAME:

Quiz #11 October 7,, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1a) If I play 4 frequencies {200, 1000, 3000, 10000} all at **60dB**, which will **appear** to be the **loudest**?



1b) Which will **appear** to be the **softest**?

2a) If I play 4 frequencies {200, 1000, 3000, 10000} all at **60Phons**, which will need to **largest** dB level?

2b) Which will need to **smallest** dB level?

3) If we model the ear canal as a **stopped** pipe with a length of 2.5 cm (0.025m), compute the frequency of the lowest resonance.

Bonus: (0 Points) What was the 2025 Nobel Prize in Physics awarded for?

NAME:

Quiz #12 October 9, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1) Define Formants

Define or give an example of Subjective Tones

Define the Chorus Effect

2) Match the following psychological properties
{Loudness, Pitch, Timber}with the corresponding physical properties.

Physical	**Psychological**
Frequency	
Intensity	
Waveform	

3a) Vibrato is a periodic variation of the frequency of the tone about its average value. It is also known as frequency modulation.

TRUE or FALSE:

The perception of a complex sound (as described in Chpt.6) is very sensitive to the phase of the individual components.

TRUE or FALSE:

The perceived pitch is completely independent of the volume level of the sound.

TRUE or FALSE:

NAME:

Quiz #13 October 14, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1b) If D/C=9/8 and E/D=9/8 what is the interval E/C?

Important: get the fractions in the correct order; higher note ⇒ larger number

Hint: $\frac{E}{C} = \frac{E}{D} \times \frac{D}{C} = \text{——} \times \text{——} =$

1b) If D/C=9/8 and E/C= 5/4 what is the interval E/D?

Hint: $\frac{E}{D} = \frac{E}{C} \times \frac{C}{D} = \text{——} \times \text{——} =$

1a) If E/C=5/4 and F/C= 4/3 what is the interval F/E?

Hint: $\frac{F}{E} = \frac{F}{C} \times \frac{C}{E} = \text{——} \times \text{——} =$

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2) What are the ideal ratios for

Octave

Fifth

Fourth

---

3) For the Pythagorean sytem:

a) What interval is this based on???

(Hint: what interval is perfect in this system)

b) Name a problem with this system:

(Hint: there are many to choose from)

Bonus (0 Points) The Pythagorean scale is 1) What Pythagoras paid his workers, 2) what he scraped off his fish, 3) what he used to weigh his fish?

NAME:

Quiz #14 October 16, 2025

Physics 1320 Music & Physics Prof. Tunks & Olness

1b) If D/C=9/8 and E/D=9/8 what is the interval E/C?

1b) If D/C=9/8 and E/C= 5/4 what is the interval E/D?

1a) If E/C=5/4 and F/C= 4/3 what is the interval F/E?

2) What are the ideal ratios for

Octave	Major Third
Fifth	Minor Third
Fourth	Major Second

3)Name a problem with the below tuning/temperament system:

a) Pythagoreann

b) Just

c) Mean-Tone

d) Equal

Bonus: "The Well-Tempered Clavier" Book 1 by J.S. Bach has a collection of preludes and fugues. ***How many and in what keys???***

NAME:

Quiz #15 October 22, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

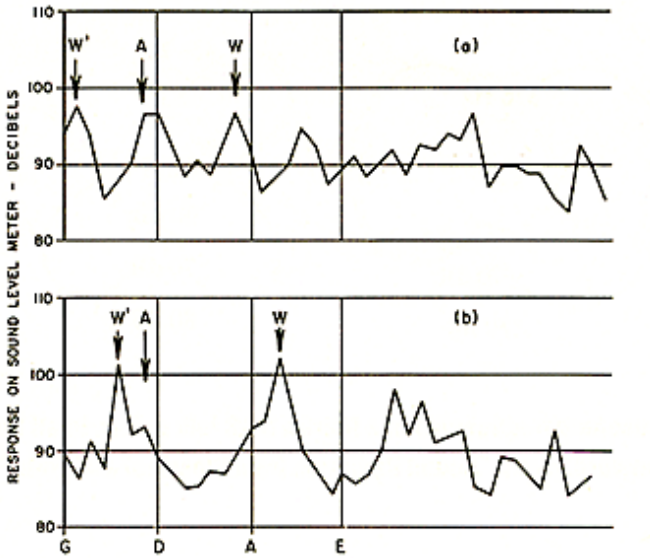
1) In brief, what is the purpose of: the bridge:

the bass bar:

the sound post:

2a) The figure shows the SIL response for two violins. Which is the better quality instrument???

WHY??



3) Match each instrument with its classification: *(Draw line: one line per instrument.)*

Aerophone	Violin
Cordophone	Bell
Electrophones	Bass Drum
Idiophone	Electric piano
Membranophone	Trumpet

NAME:

Quiz #16		November 4, 2025
Physics 1320	Music & Physics	Prof. Baker & Olness

1) A **flute** (L=0.60m) functions as an **<u>open</u>** pipe.
a) Draw the second harmonic f_2. *(Careful, NOT the first/lowest harmonic).*
b) Compute second harmonic f_2 frequency. (v=340m/s)

2) A **clarinet** (L=0.60m) functions as a **<u>closed</u>** pipe.
a) Draw the second harmonic f_2. *(Careful, NOT the first/lowest harmonic).*
b) Compute second harmonic f_2 frequency. (v=340m/s)

3a) In a simplified case, approximately where should the register key be located on a flute if it is playing the lowest note of the register??? [Measure relative to the mouthpiece.]

3b) In a simplified case, approximately where should the register key be located on a clarinet if it is playing the lowest note of the register??? [Measure relative to the mouthpiece.]

3c) A sax has an "octave" key, but the clarinet has a "register" key.
What fundamental property of the instruments causes these difference?

NAME:

Quiz #17 November 6, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1) To lower a trumpet a half-step, I increase the length by 6%; thus, if I multiply the length by (1.06), I get the correct length. If I want to lower the pitch by FIVE half-steps, by what percent should I increase the length??? (Hint: it is NOT 30%)

2) Most instruments do NOT use the 7^{th} harmonic. But, the trombone can. a) What is the general problem with the 7^{th} harmonic, and b) what feature of the trombone allows the trombone to use this harmonic while a trumpet cannot.

3a) The piccolo trumpet is half the length of a standard trumpet.
Why is it necessary to have a 4^{th} valve on the piccolo, but not the standard trumpet.

b) On a trumpet, what is the purpose of the valve slides on the 1^{st} and 3^{rd} valves?

c) On the trombone, when you open the valve to add the f-attachment and lengthen the instrument by a 4^{th}, how does this affect the slide positions.

NAME:

Quiz #18 November 11, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

$T = K\,V/(S\,a)$ $K = 0.049$ s/ft

Assume Perkins Chapel measures: 40x60x80 ft, and assume a=0.25

1+2) Compute the reverberation time of Perkins Chapel, T

3) Describe 3 (three) properties that are important for acoustics *besides reverberation time*.

Bonus: Where is Perkins Chapel located, and why is this important???

NAME:

Quiz #19 November 13, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

1) How is it possible that a solo vocalist (without amplification) can be heard above an entire orchestra?

2) When a singer sings with helium instead of air[1], what changes and what stays the same?

3) Why is it physically impossible for sopranos to get different vowels in their highest range?

1Note: not recommended too much as air has oxygen which is sometimes useful.

NAME:

Quiz #19

November 13, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

NAME

NAME

NAME:

Quiz #23 December 4, 2025

Physics 1320 Music & Physics Prof. Baker & Olness

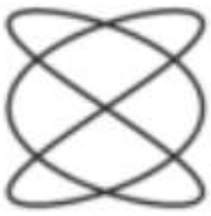
1a) Musically speaking, what is the fundamental improvement of the piano compared to the harpsichord.

b) For a piano, why are octaves NOT tuned to an exact 1:2 ratio???

c) For a piano, why do we wrap the bass strings?

2) For the vibration of a one dimensional string, our ears recognize a pitch associated with the vibration. For a two dimension membrane (such as the Chaldni plate) while the lowest frequency has a definite frequency, there is not an identifiable pitch associated to the total sound. Why??

3) Identify the frequency ratios of the below Lissajous figures.



NAME:

Quiz #24 Honors Physics Poster Night December 8, 2025
Physics 1320 Music & Physics Prof. Baker & Olness

1) Title:

First Names:

Something you though was interesting

Something else where these physics principles might apply?

2) Title:

First Names:

Something you though was interesting

Something else where these physics principles might apply?

3) Title:

First Names:

Something you though was interesting

Something else where these physics principles might apply?

4) Title:

First Names:

Something you though was interesting

Something else where these physics principles might apply?