

Physics 101: The Science of Sound

MiniTest 7a, 12/14/05

Name _____

For questions with numerical answers, draw a box around your final answer.

Except as noted, correct answers get full credit. Incorrect answers get partial credit based on the work shown.

If any problem relies on a previous answer, scoring on that problem will be based on YOUR previous answer, whether or not it is correct.

Scoring:

Raw Total: _____/100 pts

Adjusted Score: _____%

2) [10 pts] List three ways in which common musical instruments access different pitches during performance:

(A) _____

(B) _____

(C) _____

1) [15 pts] Identify the correct final pitch for each initial pitch and interval:

(a) One octave above 250Hz is (A) 31.25Hz (B) 125Hz (C) 252Hz (D) 500Hz (E) 2000Hz

(b) One fifth below 800Hz is (A) 533.3Hz (B) 640Hz (C) 795Hz (D) 1200Hz (E) 4000Hz

(c) One fourth below 600Hz is (A) 150Hz (B) 450Hz (C) 594Hz (D) 800Hz (E) 2400Hz

(d) Three semitones above 440Hz is (A) 370Hz (B) 436.8Hz (C) 518.5Hz (D) 523.2Hz (E) 1398Hz

(e) One octave and a fifth below 3000Hz is

(A) 300Hz (B) 1000Hz (C) 1200Hz (D) 1495Hz (E) 2993Hz

(f) One fourth and one semitone above 1200Hz is

(A) 953.5Hz (B) 1195Hz (C) 1589Hz (D) 1695Hz (E) 5085Hz

3) [10 pts] The purpose of a register hole on a wind instrument is...

(A) to change the length of the instrument tube.

(B) to prevent the fundamental mode by forcing a pressure node.

(C) to prevent the fundamental mode by forcing a pressure antinode.

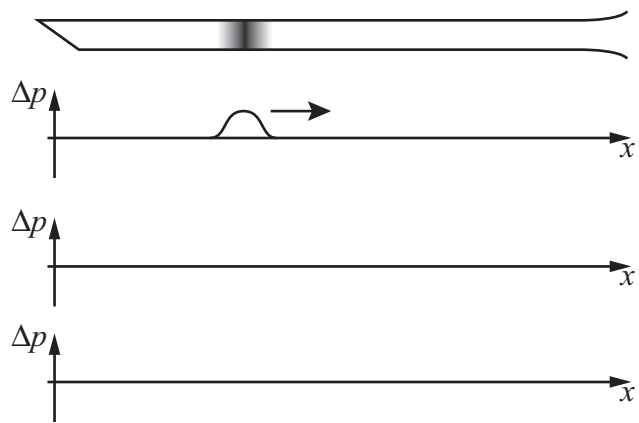
(D) to make the airstream oscillate as it enters the instrument.

(E) to identify an instrument to the police in case it is stolen.

4) [10 pts] To the right is a graph of a puff of air traveling in a clarinet as the instrument is played.

The picture shows how the position axis relates to the instrument itself. A clarinet is a reed woodwind.

On the next two axes, show how the pulse looks the next two times that it passes the middle of the instrument.



5) [6 pts] If the clarinet were replaced with a flute, which (if any) of your graphs would change?

(A) None (B) First (C) Second (D) Both

- 6) [9 pts] Below is a frequency scale with the fundamental frequency of a vibrating string marked on it. On the top side of the scale, indicate with tick marks the position of as many harmonics of the fundamental as will fit. On the bottom side of the scale, indicate with tick marks the position of progressive octaves above the fundamental (as many as will fit).



- 7) [20 pts] A slide whistle plays a certain frequency with the slide all the way out, that is, when the plunger is the maximum of 40 cm from the fipple hole. How far into the tube should the plunger be moved in order to increase the pitch by one fourth (the musical interval).



- 8) [20 pts] My recorder is 28.5 cm from fipple hole to open end. I wish to make a one-stringed instrument such that it will play the same pitch as the recorder does with all tone holes closed. The string I have is 1.6 g/m, and would work best under a tension of 110 N. How long should I make the stringed instrument?

Extra Credit) [4 pts] We have discussed in lecture something special in the way each of the following instruments (or groups) works that distinguishes it from **all** other common western instruments. Choose one, circle it, and below describe in one or two sentences what the special characteristic is.

all brass instruments

clarinet

saxophone