Physics 100 (Stapleton) Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Instrument Practice Test

Formulas and information:

* Ratio of a note’s frequency to the frequency of a note one half-step lower ≈ 1.0595
* v = λf
* Vobject = Vsound \* (fahead of source – fbehind source) / (fahead of source + fbehind source)
* Vobject = Vsound \* (2^(∆pitch/12) -1)/ (2^(∆pitch/12) +1) --- where Δp = absolute value of the drop in pitch, measured in half steps

1. What is the relationship between the frequencies of two notes that are one octave apart?

2. In the modern music of the Western world, an octave is broken up into \_\_\_\_\_ equal divisions.

3. To find the exact frequency of a musical note one half-step higher than a known note, you must multiply the known frequency by exactly \_\_\_\_.

4. A musical note with a frequency of 130.81Hz is a C.

1. What is the name of the note that is one half step higher than C?
2. What is the frequency of that note?

5. The line on the right represents the string of an instrument. The nut and bridge are labeled.

1. When the string is plucked or strummed, without pressing on the string, what length of string is vibrating?
2. If you want to play a note that is one octave higher than the open string, where should you press the string to the fingerboard? Draw a mark in that location, and label it “+1 octave.”
3. If you want to play a note that is two octaves higher than the open string, where should you press the string to the fingerboard? Draw a mark in that location, and label it “+2 octaves.”
4. If you want to play a note that is one half-step higher than the open string, where should you press the string to the fingerboard? What is the distance of this location from the nut (measured in cm)?
5. Draw a mark in this location, and label it “+1 half-step.”

6. Label a “C” on the piano keyboard below.

7. Label the other indicated keys.

8. Some of the keys you labeled have two names. For one of those keys, provide both names.



9. If you play a one octave musical scale, how many notes do you play?

10. Which major scale can be played on a piano without using any black keys?

11. Which minor scale can be played on a piano without using any black keys?

12. The picture below shows how frets are arranged on a guitar. By following the fret marks, a musician can play an ascending chromatic scale of 12 **equal** half-steps. In a sense, the half steps are equal, but the spaces between fret marks are obviously not the same size. What, then, is “even” about these half steps?

13. Starting at the indicated point below, add marks that show how to play a 1-octave **major** scale.



14. Starting at the indicated point below, add marks that show how to play a 1-octave **minor** scale.



15. The string below is shown in rest position. Assume that the two ends are fixed in position; one end represents the nut, and the other end is the bridge.

1. Draw the standing wave that will form when you pluck or strum the string, without pressing the string down in any location.
2. Label the positions of any nodes and antinodes.



16. Again, the diagram below shows an instrument string. The ends are fixed in position (one is the nut and one is the bridge). If you pluck the string and then lightly touch your finger to the point indicated below (without pressing the string against the finger board), you will change the string’s frequency.

1. Draw the new standing wave pattern that is produced when you place your finger lightly at point A.
2. Label all nodes and antinodes.
3. What happens to the wave’s frequency, compared with the frequency produced in the diagram above?



17. Describe a nearly fool-proof method of determining the key in which a song is played.

18. The speed of sound in air is about \_\_\_\_ m/s or \_\_\_\_\_\_ mph.

19. You are standing by a race track, listening to an approaching car. When you listen to the approaching car, you hear a frequency of 400Hz. You keep listening, and you notice that, after the car passes, the frequency that you hear drops to 200Hz. This is a 12 half-step drop. What was the speed of the car as it passed you?

20. Explain how electricity causes a speaker cone to move in and out.

21. Explain how a magnetic guitar pickup sends signals to an amplifier.

22. What does an amplifier do?

23. Why is the pickup wire coated with enamel?

24. Why does the pickup wire need to be wound so many times?

25. Why does the pickup wire need to be so thin?

26. Why won’t the pickup work if the wire gets broken?