Quiz 2-B Solutions

1. (a) A keyboard instrument is tuned to equal temperament according to the “scientific” pitch standard of \(C_4 = 256 \text{ Hz}\). What would be the frequency of the note \(E_4\) on this instrument?

The note \(E_4\) is four half-steps above the note \(C_4\). In equal temperament, increasing the pitch by one half-step multiplies the frequency by \(2^{4/12}\). Therefore,

\[
f_{E} = f_{C} \times 2^{4/12} \\
= 256 \text{ Hz} \times 1.26 \\
= 322.5 \text{ Hz}
\]

(b) Describe one advantage and one disadvantage of tuning a keyboard instrument in equal temperament.

One advantage of equal temperament is that the instrument can sound equally good in any key. The major disadvantage is that no intervals other than the octave are perfectly in-tune. The fact that all musical keys have similar “color” in equal temperament can be considered either an advantage or a disadvantage.

2. The wood resonance of a cello lies noticeably above the fundamental frequency of its \(D_3\) string. How could you alter the design of the instrument in order to lower this resonance? Explain your answer.

The resonant frequency of vibrating plates gets lower as the plates get larger. Therefore, by making the cello even bigger, one could lower its wood resonance until it matched the frequency of the \(D_3\) string. Additionally, thicker, stiffer plates have higher resonant frequencies than thinner, less-stiff plates. Making the plates of a cello even thinner is another way of lowering its wood resonance.
3. A major distinction between guitars and violins is the presence of frets along a
guitar’s fingerboard. In a sentence or two, describe one advantage of having frets on
a stringed instrument.

Frets enable a musician to play chords on a stringed instrument. Without frets,
there are many chords for which a musician would not physically be able to
position their fingers to play the chord in-tune. Furthermore, frets make an
instrument far easier to learn.

4. How do you think time in discussion sections should be spent? What aspect of them
would you like to see changed?

Common responses: more demos and interactive activities, present solutions on
the board, cover lecture topics in greater depth, go over common mistakes or areas
of difficulty, more cooperative worksheets, fewer cooperative worksheets, allow
for non-cooperative worksheets, focus on exam prep, good as-is, more difficult
problems with more math (okay, that last response was a little less common).