Sounds of Music – KEY

2020 UMD Invitational

Team Number (on your wristband): _____

Team/School Name:_____

No abbreviations / PRINT LEGIBLY

Student Names (First & Last): PRINT LEGIBLY

1. _____

2. _____

Total Points Possible (written test): **90**

Total Points Earned:_____

Team Number: _____ School Name: _____

30 multiple choice (1pt each - 30pts)
10 fill in the blank (2 pts each - 20pts)
3 frq (10 pts each - 30 pts)

Multiple Choice Questions (1pt each - 30pts):

1. B. Longitudinal waves
2. A. Idiophone
3. C. Chordophone
4. B. the sound wave with a frequency of 40Hz has a higher pitch
5. A. the sound wave with a wavelength of 20m has a higher pitch
6. D. 49 m
7. D. 20 Hz and 20 kHz
8. C. 343.6 m/s
9. B. 1×10^{-8}
10. D. 1×10^{9}
11. A. 768 Hz
12. A. 15, 15
13. C. Pentatonic scale
14. B. 6
15. B. Phrygian dominant scale, C. Hijaz scale, D. Saba scale
16. C. 734.54 Hz
17. D. 48.3°C
18. B. False
19. D. nondiatonic
20. D. 11
21. A. 1
22. B. twice
23. A. increase, decrease
24. C. Refraction
25. B. decreases
26. A. one
27. D. drums
28. A. less, half
29. C. augmented
30. B. Ghan

Fill In the Blank Questions (2 pts each - 30pts):

1. tuning, 2
2. nasopharynx
3. longer, lower

4. malleus, incus, stapes
5. resonators
6. Young's, modulus
7. augmented, diminished, minor
8. 3W

Team Number: _____ School Name: _____

Free Response Questions:

1. You find a violin lying on the ground outside UMD's Computer Science building. Using your big brain, you pluck the instrument, and instantly determine that the length of its A string is 0.1 meters, the linear density of the string is 0.025 kg/meter, and the velocity of the string is 88.1 meters/second:

    a. Find the tension in the string.(3)

    b. What is the frequency of the string played? (3)

c. What note was played?(2)

d. Another note is played, creating an augmented fifth interval. What is the second note being played?(2)

2. Your professor wants you to describe how sound is produced in 5 different instruments. You (begrudgingly) decide to answer his questions.
   a. What type of instrument is a chime and how do they produce sound?(2)

Idiophone, creates sound through the vibration of the instrument

b. What type of instrument is a kazoo and how do they produce sound?(2)

Membranophone, creates sound through a vibrating membrane over a resonator

c. What type of instrument is a flute and how do they produce sound?(2)

Aerophone, creates sound through a vibrating column of air within the instrument

d. What type of instrument is a synthesizer and how do they produce sound?(2)

Electrophone, creates sound through electric action

e. What type of instrument is a lyre and how do they produce sound?(2)

Chordophone, creates sound through a vibrating string

3. You and your friend are conducting an experiment to determine the speed of sound in air. You use an old half-filled glass bottle of Coca-Cola to produce music.

f. Using a tuning system of A4, you play a note that your friend claims is 5 semitones away from your tuning standard. What are the two possible notes you are playing and what are their frequencies?(3)

587.330->D5

329.628->E4

g. What is the resonant frequency for your bottle, assuming that the speed of sound in air is 343 m/s, the cross sectional area of the bottle neck is 12.566 cm^2, the volume of the bottle is 12 oz, and the length of the bottle neck is 4 cm?(3)

513.619 Hz

h. You realize that the value you calculated in part b is wrong, because you assumed the speed of sound is 343 m/s. The air temperature is actually 17°C. What is the new speed of sound, and the actual resonant frequency for your bottle?(3)

speed of sound -> 314.9 m/s
helmholtz resonance -> 511.971 Hz

i. Calculate the percent error for part b, assuming your answer for part c is the actual value.(1 pts)

0.321% error