

Sounds of Music

Humans:

Table 7.02: Intensity of sound of different types

Jet engine	110-140 dB
Traffic	80-90 dB
Car	60-80 dB
Television	50-60 dB
Conversation	40-60 dB
Breathing	10 dB
Sound of mosquito	0 dB

Mosquito:



Written By: Mulan
* 30 minutes *

Name(s):

Team Number:

SCORE: _____ / 145

Multiple Choice (28 points)

Select ALL answers that apply.

1. A tuning fork resonates at a frequency of 441 Hz.

When sounded with a second tuning fork, a beat frequency of 7 beats/s is produced. What is the frequency of the second tuning fork? (2)

- a. 63 Hz
- b. 126 Hz
- c. 434 Hz
- d. 448 Hz
- e. 3,087 Hz

2. A wave travels from a steel core string to the wooden base of a violin. Which of the following characteristics remain the same? (2)

- a. Young's modulus
- b. Speed
- c. Wavelength
- d. Frequency
- e. Bulk modulus

3. In which medium would sound travel the fastest? (4)

- a. A solid with an elastic modulus of 144 GPa and a density of 7.87 g/cm^3
- b. A liquid with a bulk modulus of 225 GPa and a density of 997 kg/m^3
- c. Air at a temperature of 34 degrees Celsius
- d. A stretched string with a tensional force of 315 N and a linear density of 0.06 g/cm^3
- e. Same speed for all mediums

4. A sound wave has a wavelength of 1.3 m. What is the distance between the center of a compression and the next adjacent rarefaction? (4)

- a. 0.33 m
- b. 0.43 m
- c. 0.65 m
- d. 0.86 m
- e. 2.6 m

5. A musician blows harder into the mouthpiece of a clarinet. Which of the following increases? (4)

- a. Timbre
- b. Amplitude

- c. Frequency
- d. Velocity
- e. Period

6. What is the sound intensity level of an orchestra playing at a sound intensity of $2.2 \times 10^{-4} \text{ W/m}^2$? (4)

- a. 2.2 dB
- b. 34 dB
- c. 83 dB
- d. 337 dB
- e. 22,000 dB

7. An ambulance is speeding towards a parked car at a velocity of 40.0 m/s. The ambulance emits a frequency of 457 Hz. What frequency is detected by the car? Assume that the speed of sound is 343 m/s. (2)

- a. 403.7 Hz
- b. 409.3 Hz
- c. 510.3 Hz
- d. 517.3 Hz
- e. 577.7 Hz

8. An observer is R meters away from a speaker. What sound intensity I would the observer experience if the distance between the observer and the speaker was halved? (2)

- a. $\frac{I}{2}$
- b. I
- c. $2I$
- d. $4I$
- e. $6I$

9. Speaker A produces a sound intensity level of 13 dB. Speaker B produces sound intensity level of 43 dB. Which statement(s) is true? (4)

- a. Speaker B's sound intensity is 30 times that of Speaker A
- b. Speaker B's sound intensity is 300 that of Speaker A
- c. Speaker B's sound intensity is 1,000 times that of Speaker A
- d. Speaker A's volume is $\frac{1}{3}$ that of Speaker B.
- e. Speaker A's volume is $\frac{1}{6}$ that of Speaker B
- f. Speaker A's volume is $\frac{1}{8}$ that of Speaker B

Term Identification (18 points)

Match the term with the fitting description.

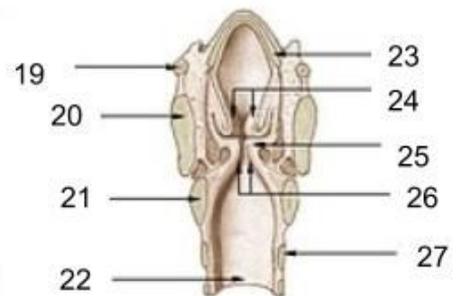
Adiabatic	Rarefaction	Frequency	Phase	Wavelength
Wavenumber	Anechoic	Acoustic	Sinusoidal	

- 10. _____ Type of feedback that is caused by a regeneration of sound leaving a speaker and entering a microphone. (2)
- 11. _____ The waveform of a sound wave. (2)
- 12. _____ Type of wave that transfers energy without the transmission of heat. (2)
- 13. _____ The complete absence of sound waves, typically created through dissipation and absorption. (2)
- 14. _____ The spatial period of a wave. (2)
- 15. _____ The inverse of period. (2)
- 16. _____ An area of low relative density in a longitudinal wave. (2)
- 17. _____ In units of cycles per unit distance. (2)
- 18. _____ The location of a waveform at a certain point in time. (2)

Sound Principles (38 points)

Refer to the diagram of the larynx for Questions 19-27. (2 points each)

- 19. _____
- 20. _____
- 21. _____
- 22. _____
- 23. _____
- 24. _____
- 25. _____
- 26. _____
- 27. _____



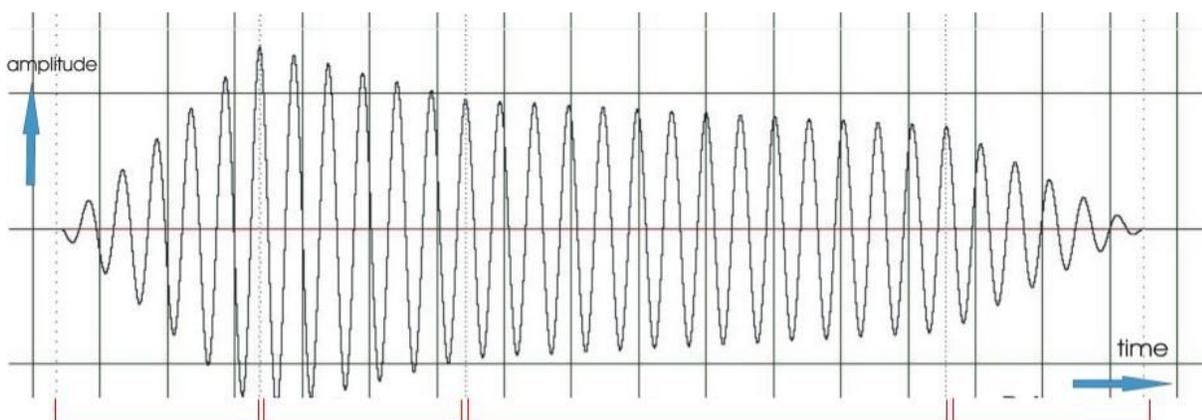
28. How is sound produced as air travels through the vocal folds? (4)

29. Describe the place theory and explain how vocal formants contribute to speech distinction. (5)

30. Compare specular and diffuse reflection. You may supplement your answer with a diagram. (4)

31. Describe the principle of wave theory. (3)

32. Label the diagram of the sound waveform below with the points of articulation. (4)



Music Theory (61 points * indicates no partial credit given)

33. Order the following cadences from weakest to strongest: Imperfect Authentic Cadence, Deceptive Cadence, Perfect Authentic Cadence, Half Cadence, Plagal Cadence. (5)

Refer to the composition below for questions 34 - 37

Nº 33.

The musical score for No. 33 is presented in four systems. The first system begins with a piano (*p*) dynamic. The second system includes a pianissimo (*pp*) dynamic. The third system also includes a pianissimo (*pp*) dynamic. The fourth system starts with a forte (*f*) dynamic. The score is in 3/4 time and features a mix of chords and melodic lines in both hands.

34. What key does the piece start in? (2)*

35. What key does the piece temporarily shift into in measures 14-24? (2)*

36. What cadence is seen in measures 15-16? (3)*

37. Write the Roman Numeral chord progression for measures 1-3. Include inversions, if any. (6)

Refer to the musical excerpt below for Questions 38 - 40

A musical excerpt in treble clef, 6/8 time, with a key signature of one flat (Bb). The excerpt consists of 17 measures, numbered 2 through 17. The melody is written on a single staff. Measure 2 starts with a quarter rest, followed by quarter notes G4, A4, Bb4, and C5. Measure 3 has quarter notes D5, C5, Bb4, and A4. Measure 4 has quarter notes G4, F4, E4, and D4. Measure 5 has quarter notes C4, Bb3, A3, and G3. Measure 6 has quarter notes F3, E3, D3, and C3. Measure 7 has quarter notes Bb2, A2, G2, and F2. Measure 8 has quarter notes E2, D2, C2, and Bb1. Measure 9 has a quarter rest. Measure 10 has a dotted quarter note G2. Measure 11 has quarter notes F2, E2, D2, and C2. Measure 12 has quarter notes Bb1, A1, G1, and F1. Measure 13 has quarter notes E1, D1, C1, and Bb0. Measure 14 has quarter notes A0, G0, F0, and E0. Measure 15 has quarter notes D0, C0, Bb0, and A0. Measure 16 has quarter notes G0, F0, E0, and D0. Measure 17 has a quarter note C0.

38. What meter is this piece in? (2)*

39. What mode is this piece in? (2)*

40. What is musical texture? Identify the texture of the piece above. (4)

41. Write the Roman numeral chord progression for the musical excerpt shown below. Include inversions, if any. (5 points total, +0.5 for each correct chord)

A musical excerpt in treble and bass clefs, 3/2 time, with a key signature of one flat (Bb). The excerpt consists of four measures. The first measure has a whole note chord in the treble (Bb4, A4, G4) and a whole note chord in the bass (Bb2, A2, G2). The second measure has a whole note chord in the treble (A4, G4, F4) and a whole note chord in the bass (A2, G2, F2). The third measure has a whole note chord in the treble (G4, F4, E4) and a whole note chord in the bass (G2, F2, E2). The fourth measure has a whole note chord in the treble (F4, E4, D4) and a whole note chord in the bass (F2, E2, D2). The excerpt ends with a fermata over the final chord.

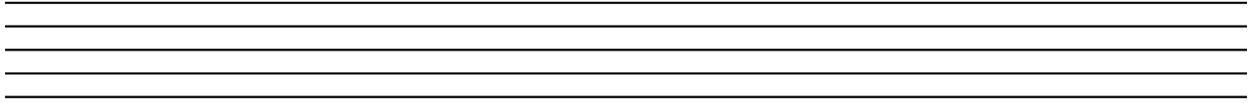
42. What meter is this excerpt in? (2)*

43. What is the relative minor of the key? (2)*

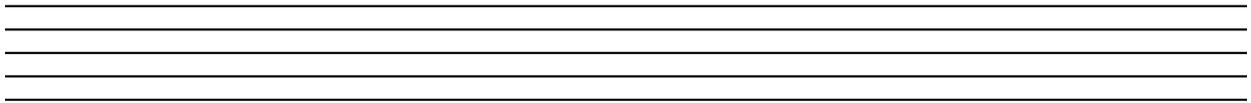
44. What cadence is seen at the end of the excerpt? (2)*

45. What is the difference between equal temperament, just temperament, and pythagorean temperament? (4)

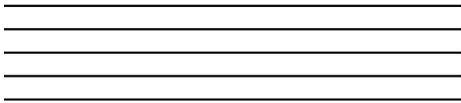
46. Write the F# Phrygian mode in the staff below. (4)*



47. Write the Eb major pentatonic scale in the staff below. (4)*



48. Write out a half-diminished Eb chord in the first inversion. (2)*



49. Circle all of the unaccented passing tones in the excerpt below. (10 points total, +0.5 for each correctly identified PT)