Sounds of Music C - Sounds of Music C - Feb 7 SO Practice - 02-07-2021

- You have 50 minutes to complete this written test.
- Assume that it is 20 degrees Celsius and the speed of sound is 343 m/s unless otherwise specified.
- The tiebreakers are in this order: Best Pitch Score, Best Song Score, Best Test Score, Question 33, Question 8, Question 26, Question 35, Question 41, Question 30, Question 5
- Please maintain academic integrity.
- Good luck to all and have fun!!
- The codeword is **"BEBOP"**

1. (1.00 pts) _____ is described as the quality of sound, for example: the tone of a musical instrument being played, a creak of a wooden door, or the quality of a singing voice

- (●) A) Timbre
- ( ) B) Sonic Texture
- ( ) C) Resonance
- ( ) D) Pitch Structure

2. (1.00 pts) Which of the following musical terms is NOT used to describe volume?

- ( ) A) Morendo
- ( ) B) Sforzando
- ( ) C) Diminuendo
- (●) D) Piu mosso
- ( ) E) None of the above

3. (1.00 pts) How large is the difference between the faintest and loudest sounds that can be perceived by the average human?

- ( ) A) 20 db
- ( ) B) 40 db
- ( ) C) 100 db
- (●) D) 120 db
- ( ) E) 150 db

4. (1.00 pts)
To produce sound, brass instruments rely on a double-reed action of the lips, which is supported by the Bernoulli effect. Which of the following accurately describes the Bernoulli effect?

- ( ) A) As air flows past the constricted lips, it slows down. This lower velocity leads to a lower pressure exerted on the instrument tube's walls at that point.
- ( ) B)
As air flows past the constricted lips, it slows down. This lower kinetic energy leads to a higher potential energy, or pressure exerted on the instrument tube's walls at that point.
- ( ) C) As air flows past the constricted lips, it speeds up. In order to satisfy Bernoulli's principle, the pressure on the tube's walls increases accordingly.
- (●) D) As air flows past the constricted lips, it speeds up. In order to satisfy Bernoulli's principle, the pressure on the tube's walls decreases.

5. (1.00 pts) Which of the following major scales contains at least one flat?

A) B major
B) C Major
C) F major
D) G major

6. (1.00 pts) In which of the following scenarios would it be appropriate to measure beat frequency?

A) A violin's A string is out of tune and needs to match a tuner playing a note of 440 Hz.
B) A guitarist needs to play a set of notes perfectly in time with a metronome playing a sound at 120 BPM.
C) A singer needs to be able to hold a high note for an extended period of time.
D) A sound engineer needs to determine the best material with which to enclose a soundproof room.
E) None of the above

7. (1.00 pts) Which of the following factors of the inside of the concert hall does not affect the speed of the sounds being created?

A) The density of the air
B) The air pressure
C) The humidity
D) The temperature

8. (1.00 pts)
If you have ever sung in the shower, you might notice that the sound of your voice is prolonged after you have stopped making noise due to the tendency of sound waves to bounce off of walls in rapid succession. What is this phenomenon known as?

A) Dampening
B) Reverberation
C) Oscillation
D) Impedance
E) None of the above

9. (1.00 pts)
Helmholtz motion, also known as "stick-slip" motion, refers to the pattern of motion of a bow that drives string instruments. Which of the following is NOT true about Helmholtz motion or bowing?

A) The cycle of Helmholtz motion has the same period as the vibration of the violin's string.
B) The player applies rosin on the bow to increase the coefficient of static friction and decrease the coefficient of kinetic friction.
C) The cycle of Helmholtz motion is longer for a violin than a double bass.
D) Bowing allows a violinist to produce a sustained note by putting energy into a vibrating string.

10. (1.00 pts) Which of these is the name for the cavity of the inner ear in which sound vibrations are converted into nerve impulses, transmitting sound waves to your brain?

A) Malleus
B) Incus

◉ C) Cochlea

○ D) Vestibule

11. (1.00 pts) Which of the following provides an accurate example of the pizzicato technique of playing string instruments?

○ A) A guitarist creates shortened sounds by slapping the fingerboard of the guitar to produce notes.

○ B) A violinist bounces the bow across the string to create light, bouncy notes.

○ C) A banjo player plays notes on upstrokes in order to be able to play twice as many notes.

◉ D) A pianist opens the cover of a piano and creates notes by directly plucking the strings.

12. (1.00 pts) What is the difference between a melodic minor and a harmonic minor scale?

○ A) The melodic descending scale is different than ascending, while harmonic ascending and descending scales are the same

○ B) The harmonic descending scale is different than ascending, while melodic ascending and descending scales are the same

○ C) Melodic minor scales raise both the sixth and seventh notes one semitone when ascending, while harmonic minor scales only raise the seventh

○ D) B and C

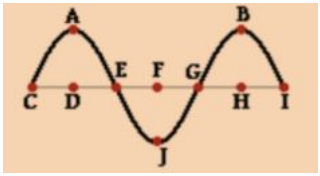
◉ E) A and C

○ F) None of the above

13. (3.00 pts) Calculate the wavelength of sounds at 20,000 Hz in 30.0˚C air. Write your answer in cm and assume frequency values are accurate to two sig figs

Expected Answer: Speed of sound = [331 + 0.6*Temperature (°C)] m/s = 331 + 0.6*30 = 349 349 m/s (velocity) / 20,000 Hz = 0.017m = 1.7 cm ANSWER: 1.7 cm (2 pts) Sig Figs if answer is correct (1 pt)

14. (3.00 pts) A transverse wave is traveling through a medium. See the diagram below. The particles of the medium are vibrating_____



Expected Answer: Parallel to the line joining AD (answer should be similar to this, but exact wording is not necessary)

15. (5.00 pts) Write the relationship for the resonant wavelengths for a tube: (write the formula)

A. Closed at ONE end (2.5 pts)

B. Open at BOTH ends (2.5 pts)

Expected Answer: A. λ = 4L/n, where n is an odd integer (1,3,5,...) B. λ = 2L/n, where n is any integer (1,2,3,...)

16. (2.00 pts)
Two sounds of identical pitch created by two different instruments do NOT have the same sound waves. This is because of _____, other frequencies besides fundamental harmonic frequencies that exist in musical instruments.

Overtones

17. (5.00 pts) Briefly describe how the reflection of sound is important to the design of concert halls and auditoriums.

Expected Answer: The acoustics of sound must be considered in the design of such buildings. The most important considerations include destructive interference and reverberations, both of which are the result of reflections of sound off the walls and ceilings. Designers attempt to reduce the severity of these problems by using building materials that reduce the amount of reflection and enhance the amount of transmission (or absorption) into the walls and ceilings. The student should mention: -Destructive interference and reverberations -How designers can counter these problems -Partial credit can be awarded if the student only mentions one of the two

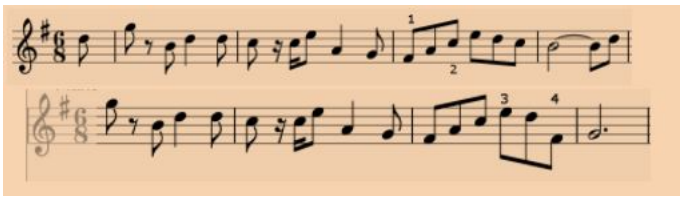
18. (2.00 pts)
Determine the wavelengths of the fundamental and the next harmonic of a clarinet of length L that is closed on one end and open on the other. Express your answer in terms of L. (1 point each)

A. Wavelength of fundamental

B. Wavelength of next harmonic:

Expected Answer: A. 4L B. (4/3)L

19. (10.00 pts) Refer to the following musical excerpt to answer the next question:



A. What key is this excerpt in? Be sure to indicate whether it is major or minor

B. Briefly explain the meaning of a time signature. What is this excerpt's time signature?

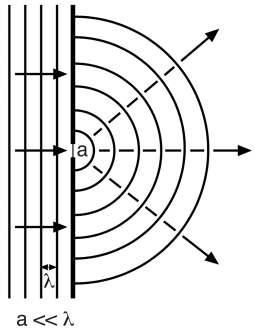
C. What are the pitches of the highest and lowest notes in the excerpt? Give the names of the notes in octave notation

D. What is the interval between the notes numbered 1 and 2?

E. What is the interval between the notes numbered 3 and 4?

Expected Answer: A. G Major (2 pts for G Major, 0.5 pts if said e minor) B. The time signature represents the amount of beats per measure. 6/8 (1 pt for general time signature meaning that is explained separately from the next part of the answer, 1 pt for 6/8) C. Highest: G5 Lowest: F#4 (0.5 pts for G, 0.5 pts for the 5, 0.5 pts for F#, 0.5 pts for the 4) D. Diminished 5th (or Tri-tone) (2 pts for diminished 5th or tritone, 1 pt for augmented 4th) E. Minor 7th (2 pts for minor 7th, 0.5 pts if said Major 7th)

20. (1.00 pts) What does the following image illustrate?



- A) Doppler Effect
- B) Bernoulli's Principle
- C) Huygens' Principle
- D) Walther's Law
- E) Graham's Law

21. (1.00 pts) Arrange the following intervals in the order from most dissonant to most consonant: Half Tone, Whole tone, Fifth, Minor Third

- A) Half Tone, Whole tone, Minor Third, Fifth
- B) Minor Third, Half Tone, Whole Tone, Fifth
- C) Whole Tone, Fifth, Minor Third, Half Tone
- D) Minor third, Half Tone, Fifth, Whole Tone
- E) Fifth, Minor Third, Half Tone, Whole Tone

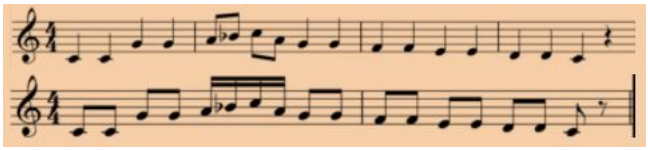
22. (1.00 pts) What anatomical part would be considered the resonator for a singer?

- A) Vocal Cords
- B) Vocal Tract
- C) Lungs
- D) Tongue
- E) Epiglottis

23. (3.00 pts) A guitar D string is 0.8 m long. The open string frequency is 294 Hz. How far from the bridge of the guitar should the fret be for playing an A4 (440 Hz)?

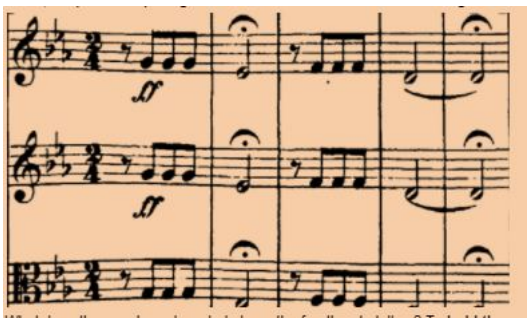
Expected Answer: 0.53 m +/- 0.05 m. Explanation: 0.8 m / (440 Hz / 294 Hz) = 0.53 m

24. (1.00 pts) What computational technique is shown in the image?



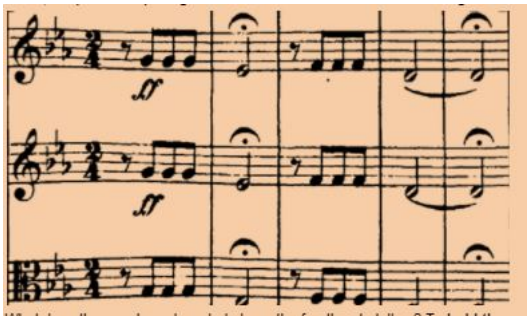
- (●) A) Diminution
- ( ) B) Imitation
- ( ) C) Canon
- ( ) D) Augmentation
- ( ) E) Repetition

25. (1.00 pts)
Beethoven's 5th symphony is one of the greatest classical pieces and is famous for its iconic opening (see picture). It is the sound of "fate knocking at the door." But looking at the sheet music, the powerful opening doesn't start with a note. What does it begin with?



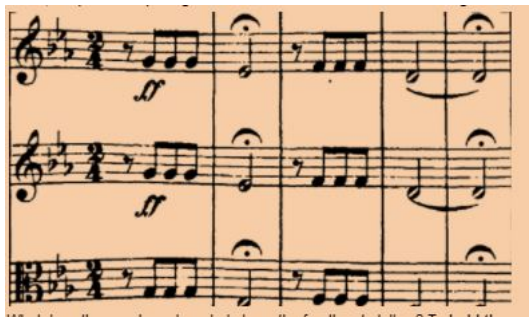
- ( ) A) A grace note
- (●) B) A rest
- ( ) C) A codetta
- ( ) D) An arpeggio
- ( ) E) A turn
- ( ) F) A tie

26. (3.00 pts)
The 4 notes of this opening are very significant. This theme germinates to other parts of the piece. You will hear it over and over again in different variations. What is the musical terminology for this?



Motif

27. (1.00 pts) What does the arc-shaped symbol above the fourth note tell us?



- A) To play the note louder than the others
- B) To play the note softer than the others
- C) To play crisply and detached
- D) To hold the note for longer than its value
- E) To use the damper pedal
- F) To play a trill with an added beginning from above or below

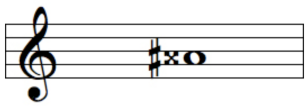
28. (2.00 pts) _____ refers to sounds that have frequencies that are beyond the range of human detection.

Ultrasound

29. (1.00 pts)
A popular demonstration done in physics classes involves wetting your finger and running it over the rim of a wine glass, creating a very distinct ringing pitch. What property is this demonstrating?

- A) Sonic Boom
- B) Beat Frequency
- C) Syncopation
- D) Constructive Interference
- E) Walther's Law
- F) Resonance

30. (1.00 pts) What note is this?



- A) A
- B) A#
- C) B
- (●) D) C
- E) C#
- F) D

31. (1.00 pts) What is a short repeated musical idea called? (It's often an accompaniment but can be the primary melodic content as well.)

- (●) A) Riff
- B) Enharmonic
- C) Coda
- D) Mode
- E) Cadence

32. (1.00 pts) Which musical texture describes a melody with harmony accompaniment and is typical of song form?

- A) Unison
- (●) B) Homophony
- C) Heterophony
- D) Polyphony
- E) Antiphony

33. (4.00 pts) Why can sound bend around a corner? Why can you hear someone who's talking around a corner but not see them?

Expected Answer: Huygens' Principle (1 pt) tells us that waves can bend (i.e. bend around a corner). Sound waves bend around objects of a similar size to their wavelength. (1 pt) The wall has a similar size to the sound's wavelength. This effect is called diffraction. Light also follows Huygens' Principle but light has a very small wavelength, so only very small objects or gaps can affect its direction. The wall blocks the light and the person can't see around the corner. (2 pts)

34. (1.00 pts) Why is there no sound in space? (disregard the special, very specific cases)

- A) Sound waves get absorbed quickly so it doesn't have the chance to propagate
- B) There is no gravity in space
- C) The temperature is too high for sound waves to propagate
- (●) D) Sound waves need a medium such as air to propagate them
- E) Sound waves get absorbed quickly so it doesn't have the chance to propagate

○ F) None of the above

35. (1.00 pts) What phenomenon is behind the magic of active noise cancelling in noise-cancelling headphones?

○ A) Constructive Interference
○ B) Resonance
◉ C) Destructive Interference
○ D) Law of Reflection
○ E) Echolocation
○ F) None of the above

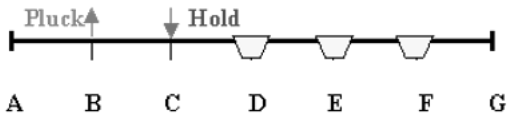
36. (2.00 pts)
The speed of sound in a particular mixture of gases is 110 m/s. If a chime is hit, playing a note with a wavelength of 1.49 m, what are the frequency and name of the note?

Expected Answer: 73.8 Hz, D2 (0.75 pt for frequency, 0.25 units, 1 pt for name)

37. (3.00 pts)
Mrs. Nikolić is driving along a highway at 67.0 miles per hour when she hears a police siren behind in the left lane, with a frequency of 823 Hz. After the police car passes her, she hears the frequency fall to 742 Hz. Find the speed of the police car in miles per hour.

Expected Answer: 107 miles per hour (±5 scores full credit, ±10 scores half credit)

38. (1.00 pts)



A guitar string is stretched from point A to point G. Equal intervals: A, B, C, D, E, F, and G are marked off. Paper “riders” (small pieces of paper partially folded across the string) are placed on the string at D, E, and F. The string is pinched at C and twanged at B. See the above diagram. What happens?

○ A) All the riders jump off
○ B) None of the riders jump off
○ C) The rider at E jumps off
◉ D) The riders at D & F jump off
○ E) The riders at E & F jump off

39. (1.00 pts)

Your neighbor is using some power tools, and the sound is very loud and annoying, so you decide to go for a walk. When you get four times farther from your neighbor, by how much has the sound intensity level decreased?

- A) 6 dB
- B) 12 dB
- C) 20 dB
- D) 40 dB
- E) 160 dB

40. (3.00 pts) What is the physical reason that two notes produce a consonance?

Expected Answer: The ratio of their frequencies consists of small integers

41. (3.00 pts) What unique acoustic property is possessed by a parabolic dish?

Expected Answer: It focuses all incoming sound to one point (the focus)

42. (1.00 pts)

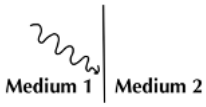
In this sound wave, which of these letters represents an antinode?

- A) A
- B) B
- C) C
- D) Both A and B
- E) Both A and C
- F) Both B and C

43. (1.00 pts) The human ear is generally most sensitive to sounds in which range?

- A) 125 to 250 Hz
- B) 250 to 500 Hz
- C) 500 to 1000 Hz
- D) 1000 to 2000 Hz
- E) 2000 to 4000 Hz

44. (1.00 pts)



In the above diagram, a sound wave, traveling through a medium, hits a boundary to a similar, but not identical medium. The boundary is at an oblique angle to the direction of the wave. Which boundary behavior will be most apparent?

- (●) A) Refraction
- ( ) B) Diffraction
- ( ) C) Reflection
- ( ) D) Transmission with no change in speed or direction
- ( ) E) The sound wave will be stopped and its energy will disperse

The following 6 questions will be about this excerpt of The Moldau by Bohemian composer Bedřich Smetana. Please listen to this recording to answer the questions.

0:00 / 1:05

45. (5.00 pts) Describe the instrumentation. In your answer, name at least 5 instruments that you can hear.

Expected Answer: Acceptable Instruments: Violin, Viola, Cello, Bass, Harp, Clarinet, Flute, Bassoon, French Horn, Oboe, Timpani/Percussion, Etc.

46. (1.00 pts) Which tempo best describes this piece?

- ( ) A) Adagio
- (●) B) Allegro
- ( ) C) Presto
- ( ) D) Lento
- ( ) E) Andante

47. (1.00 pts) At the very end of the recording, the tempo gradually slowed down a bit. Which terms could be used to describe this?

(Mark **ALL** correct answers)

- [x] A) Rallentando
- [x] B) Ritardando
- [ ] C) Scherzando
- [x] D) Allargando
- [ ] E) Sforzando
- [ ] F) Sostenuto

48. (1.00 pts) What is the time signature of this piece?

- ○ A) cut time
- ○ B) 3/4
- ○ C) 4/4
- ◉ D) 6/8
- ○ E) 12/8
- ○ F) None of the above

49. (1.00 pts)
Smetana composed this piece while being completely deaf. Similar to Beethoven, Smetana's most remembered musical work took place when he could not physically hear music at all. Pretty crazy, right?

Which statement(s) is/are not true about nerve deafness?

(Mark **ALL** correct answers)

- ☐ A) occurs when nerves fail to transmit signals to the brain
- ☐ B) occurs because of a deterioration of the hair cells or the nerves leading to the brain
- ☑ C) this kind of deafness occurs most commonly in younger people
- ☐ D) it is a problem of the inner ear
- ☑ E) it's a problem with the ossicles, and it is frequently a result of repeated infections in the middle ear
- ☐ F) presbycusis is one form of nerve deafness

50. (3.00 pts)
This piece is named after the longest river within the Czech Republic. How did Smetana and the orchestra evoke this imagery and emotion of the flowing river in his composition? What musical techniques did they use?

Expected Answer: Must use proper musical terminology and mention at least 1 musical technique. Examples: Legato was used to show a moving river, Dynamic Fluctuations, Pizzicato and Triangle resemble water ripples, etc.

51. (8.00 pts) Write the melody of this tune using solfège. There are 16 notes in this melody beginning with La.

0:00 / 0:15

Expected Answer: La, Ti, Di, Di, Ti, La, Si, La, Ti, La, Si, Fi, Fi, Mi, Fi, Do Alternatively: La, Ti, Di, Ti, La, Si, La, Ti, La, Si, Fi, Fi, Mi, Fi, Do

Thank you! Hope you enjoyed the test and got some good practice in! Don't forget to submit your device testing portion. (Reminder: The codeword is **"BEBOP"**). Best of luck with your other events and competitions!

By the way, it would be great if you could fill out this Feedback Form (https://forms.gle/YY4hMzyKKXR4UeB66). It is completely anonymous and you may answer however much or little you want. Any feedback is appreciated. Thanks in advance!

- Joanna (zhgjoanna@gmail.com), Yuri (yurioverton@yahoo.com), Jack (yangjieqin1028@gmail.com)