Dear Educator,

Thank you for choosing the Cleveland Institute of Music. Inside this packet, you will find all of the materials your class will need for your upcoming Vibrations: Science of Sound videoconference. There are no pre-conference lessons for this class, **but please note the classroom set up instructions on p. 2.** If at any time you have questions or concerns, please feel free to contact me. We look forward to “meeting” you!

Sincerely,

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During the Videoconference

Classroom Set Up:

- Please divide students into groups of 4. (Materials are provided for up to 8 groups; if there are more than 32 students, there can be some groups of 5 students). Each group will need:
  - 1 plumb bob with string
  - 1 stop watch
  - 1 adjustable clamp
  - 1 metal ruler
  - 1 set of springs (2 springs and 2 rings)
  - 1 carabiner with 3 hex nuts
  - 1 calculator
  - 1 data sheet (p. 3)
  - 1 pencil (students provide their own)

- Please assist us during the videoconference by calling on your students to answer and ask questions.

Videoconference activities will be selected from the following:

- Introduction: Listen to a musical performance and discover how different pitches are made on musical instruments
- Experiment: Use a pendulum to determine frequency, and discover how length affects frequency.
- Experiment: Using rulers, create different pitches by making the rulers vibrate.
- Experiment: Using a spring mass system, discover the effect of amplitude on frequency.
- Demonstration: Discover how amplitude can affect one’s ability to hear.
**Pendulum Experiment**

<table>
<thead>
<tr>
<th>Trial Number</th>
<th>Length (Centimeters)</th>
<th>Time for 10 Cycles (Seconds)</th>
<th>DO MATH HERE ( f = \frac{# \text{ of cycles}}{# \text{ of seconds}} )</th>
<th>Frequency (Hertz)</th>
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<tr>
<td>3</td>
<td>30</td>
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**Spring Mass Experiment**

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<th>Time for 10 Cycles (Seconds)</th>
<th>DO MATH HERE ( f = \frac{# \text{ of cycles}}{# \text{ of seconds}} )</th>
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<td>Low</td>
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<td>3</td>
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<tr>
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<td>High</td>
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</table>
Ohio Academic Content Standards: Music

**Historical, Cultural and Social Context**

**Grade 7**

2. Demonstrate how elements of music are used to create various music styles.

**Creative Expression and Communication**

**Grade 6**

1. Sing and/or play, alone and with others, using good posture and breath control throughout their range, a varied repertoire of music representing diverse cultures with appropriate dynamic expression and tempo for the work being performed.
2. Play a variety of instruments, alone and with others, with increasingly complex rhythms and melodic phrases.
3. Respond appropriately to the cues of a conductor.

**Grade 7**

2. Perform accurately, alone and in small and large groups, with good posture producing an appropriate tone quality.
3. Respond appropriately to the cues of a conductor.

**Grade 8**

2. Perform accurately, alone and in small and large groups, with good posture producing an appropriate tone quality.
3. Respond appropriately to the cues of a conductor.

**Analyzing and Responding**

**Grade 6**

1. Distinguish the use of dynamics, meter, tempo and tonality in various pieces of music.
3. Describe instruments used in Western traditional instrumental ensembles and in world music ensembles.

**Grade 7**

1. Apply music vocabulary to describe a varied repertoire of music.
2. Describe use of meter and rhythm in music of various cultures.

**Grade 8**

1. Compare and contrast a varied repertoire of music on the basis of how elements of music are used to make the works unique and expressive.

**Valuing Music/Aesthetic Reflection**

**Grade 6**

1. Practice audience etiquette in selected music settings.
2. Attend and reflect on a variety of live music performances.
3. Communicate ideas about the importance of music in everyday life.

**Grade 7**

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Class Materials
1. Practice audience etiquette in selected music settings.
2. Participate in and reflect on a variety of live music performances and activities.

Grade 8
1. Practice audience etiquette in selected music settings.
2. Participate in and reflect on a variety of live music performances and activities.
3. Explain how and why people use and respond to music.

Connections, Relationships and Applications

Grade 6
4. Compare and contrast subject matter common to music and other subject areas.

Grade 7
4. Describe ways that technology is used in creating, performing and listening to music.
6. Using elements of music, describe distinguishing characteristics of music from a variety of cultures.

Grade 8
3. Use technology in creating, performing and/or researching music.
4. Use problem-solving and creative thinking skills experienced in other disciplines in music.

Ohio Academic Content Standards: Science

Physical Sciences
Grade 7
2. Describe how an object can have potential energy due to its position or chemical composition and can have kinetic energy due to its motion.
3. Identify different forms of energy (e.g., electrical, mechanical, chemical, thermal, nuclear, radiant and acoustic).

Grade 8
1. Describe how the change in the position (motion) of an object is always judged and described in comparison to a reference point.
2. Explain that motion describes the change in the position of an object (characterized by a speed and direction) as time changes.
5. Demonstrate that vibrations in materials may produce waves that spread away from the source in all directions (e.g., earthquake waves and sound waves).

Science and Technology
Grade 6
4. Explain how the usefulness of manufactured parts of an object depend on how well their properties allow them to fit and interact with other materials.

Scientific Inquiry
Grade 6
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Class Materials

2. Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.
3. Distinguish between observation and inference.

Grade 7
1. Explain that variables and controls can affect the results of an investigation and that ideally one variable should be tested at a time; however it is not always possible to control all variables.
3. Formulate and identify questions to guide scientific investigations that connect to science concepts and can be answered through scientific investigations.
4. Choose the appropriate tools and instruments and use relevant safety procedures to complete scientific investigations.
7. Use graphs, tables and charts to study physical phenomena and infer mathematical relationships between variables (e.g., speed and density).

Grade 8
1. Choose the appropriate tools or instruments and use relevant safety procedures to complete scientific investigations.
3. Read, construct and interpret data in various forms produced by self and others in both written and oral form (e.g., tables, charts, maps, graphs, diagrams and symbols).
4. Apply appropriate math skills to interpret quantitative data (e.g., mean, median and mode).

Scientific Ways of Knowing

Grade 6
1. Identify that hypotheses are valuable even when they are not supported.

Grade 7
1. Show that the reproducibility of results is essential to reduce bias in scientific investigations.
2. Describe how repetition of an experiment may reduce bias.

Grade 8
2. Explain why it is important to examine data objectively and not let bias affect observations.

National Standards: Music

2. Performing on instruments, alone and with others, a varied repertoire of music.
6. Listening to, analyzing, and describing music.
8. Understanding relationships between music, the other arts, and disciplines outside the arts.

National Standards: Science (Grades 5-8)

Unifying Concepts and Properties

● Systems, order and organization
● Evidence, models, and explanation
● Change, constancy and measurement

Science as Inquiry
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Class Materials

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

**Physical Science**
- Motions and forces
- Transfer of energy

**Science and Technology**
- Understandings about science and technology

**Science in Personal and Social Perspectives**
- Personal health
- Natural hazards
- Risks and benefits

**History and Nature of Science**
- Science as a human endeavor
- Nature of Science

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