***Music to My Ears: Create Your Own Musical Instrument!***

It's a project for physical science, and it “sounds” impossible. You will have to play it in front of the class and will write an explanation on the physics principles.

**Objectives:**

1. Construct a musical instrument out of junk and common materials such as plastic pipe, wood, glass, metal scrap, etc.
2. Demonstrate the instruments.
3. Explain physics concepts inherent in your instrument.

**Rules:**

1. The instrument must be able to play an octave in tune to receive a B grade.
The A grade is reserved for truly amazing instruments in terms of thought and construction, so my challenge to you is to **WOW** me.
2. The instrument must be able to play a song. Songs such as "Mary had a Little Lamb" or "Twinkle Twinkle Little Star" are not adequate since they do not include all the notes in an octave.
3. You must be able to demonstrate how to change the loudness of the sound produced by your instrument. Loud sounds can damage hearing; do not play your instrument too near other students’ ears.
4. Your instrument must be made of safe materials. Cover any sharp edges. Use no electricity, etc.
5. No Kazoos, Jew's Harps, pop bottles filled with water, musical saws, washtub basses, etc. When in doubt, ask.
6. This is a high school level assignment, so I am expecting high school level (or above) projects at an appropriate level of difficulty.
7. Grading will be based on
	1. # of notes played
	2. Ability to make your instrument resonate
	3. Appropriate difficulty of the instrument construction
	4. Your song of choice in an auditory presentation to the class and an explanation of the physics behind your instrument
	5. Creativity of course.

**Suggested Materials:**

You may use almost anything to build your musical instrument, such as different sizes of rubber bands, cardboard boxes, different lengths of cardboard tubes or plastic pipes, string, wooden craft sticks or tongue depressors, drinking straws, and bottles. You may use other materials of your own choosing that you bring from home, as long as you discuss this with your teacher first. Practically anything can be incorporated into a musical instrument.

**Project Hints:**

1. Think about whether you will want to play your instrument by blowing into it, strumming it, striking it, or by some other method.
2. Be creative! Don’t limit yourself to the materials suggested by your teacher. *And don’t just copy an existing instrument.* Part of your teacher’s assessment of your project will be based on originality.
3. As you decide on the design of your instrument, remember that you will need to play something on it. Your instrument must not only make sounds, but it must make different sounds.

**Design:**

The following tasks will help you start the design phase of this project*.*

1. Brainstorm all the ways you can think of that musical instruments make and modify sound.
2. Draw a diagram of your proposed instrument. Be sure to label its parts, and the materials you will use.
3. How will you play your instrument? Exactly how will your instrument make sounds? What will vibrate to create sound waves? How will your instrument make sounds of different pitch and volume?
4. Make detailed notes on the construction of your instrument. Will you need to use other materials for certain parts of your instrument? How will the parts fit together? Will you need glue or special tools to make your instrument?

**Scoring Rubric:**

In evaluating how well you complete the project, I will judge your work based on your efforts to creatively create the instrument as well as how functional it is. You will also complete a detailed drawing and description.

1. Labeled drawing of your instrument
	1. Must include all parts labeled.
	2. Detail what each piece is made out of
	3. Explain what you attached where, how, and when
2. Description of the physics concepts behind your instrument
	1. Minimum of two (2) paragraphs
	2. Should include words like pitch, frequency, wavelength, velocity, period, resonance, volume, etc.
3. Musical instrument itself.
	1. Can play 8 different notes.
	2. Can play a tune with varying pitch and volume.

**TOTAL: 100 points**

 Your instrument will be graded based on the following rubric:

 **Music to Your Ears** 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 20 | 15 | 10 | 5 |
| **Creativity of Design, Planning, and Building the Instrument** | Design is very creative. Planning is thorough, with detailed and useful notes, sketches, and materials list. Instrument is well made. | Design is fairly creative. Planning is good, with useful notes, sketches, and materials list. Instrument is fairly well made. | Design is somewhat creative. Planning is adequate, with somewhat useful notes, sketches, and materials list. Instrument construction is adequate. | Design is not creative. Planning is minimal, with brief notes, sketches, and materials list. Instrument construction is poor. |
| **Physics paragraphs** | At least two paragraphs of 5-7 sentences describing, in detail, the physics principles behind your instrument.  | At least two paragraphs of 5-7 sentences describing the general physics principles behind your instrument. | Only one paragraph of 5-7 sentences describing, in detail, the physics principles behind your instrument. | Only one paragraph of 5-7 sentences describing the general physics principles behind your instrument. |
| **Class Presentation** | Presentation is thorough and well organized. Student explains the process of design, construction, testing, and modification in detail. Student plays a simple tune and demonstrates all characteristics of the instrument. | Presentation is good. Student explains most of the process of design, construction, testing, and modification. Student plays a simple tune and demonstrates most characteristics of the instrument.  | Presentation is adequate. Student explains some of the process of design, construction, testing, and modification. Student plays a simple tune and demonstrates some characteristics of the instrument. | Presentation is brief and hard to follow. Student omits major parts of project. Student demonstrates a few characteristics of the instrument, but does not play a tune. |
| **Varying volume**  | The instrument can be played at different volumes. | The instrument may change volume but it is not controlled. | The instrument cannot be played at different volumes. |  |
| **Varying pitch**  | The instrument can play at least eight different notes (frequencies). You can demonstrate a tune or rhythm with your instrument. | The instrument can play 5-7 different notes (frequencies).  You can demonstrate a simple tune or rhythm with your instrument. | The instrument can play 3-4 different notes (frequency). You can demonstrate a simple tune or rhythm with your instrument. | The instrument can play only 1-2 different notes (frequency). You cannot play a simple tune or rhythm with your instrument, |