



Name: _____

Group: _____



Musical glasses

Scientific investigation about resonance



Background



At your age, you are surely not fans of good wine. You may, however, have had the "opportunity" of washing wine glasses...No matter, what is of interest today is not the contents, but the container. Wine glasses differ in shape, size and texture. And it is precisely this diversity we want to exploit.

Have you ever made a wine glass "sing"? Perhaps you've seen someone do so. All you have to do is slide a wet finger along the edge of the glass. It's not very hard to do, as long as both the glass and the finger are **perfectly clean**. With a little practise, you will become experts!!!

When the glass starts to vibrate, it emits a sound at a **specific frequency**. Unless you are very lucky, this frequency will not match the frequency of a note on the scale. The following table gives the correspondence between the notes on the scale and their approximate frequencies in **Hertz (number of cycles per second)**.

Frequency table of the notes on the scale

| Frequency (Hz) | C (Do) | D (Re) | E (Mi) | F (Fa) | G (Sol) | A (La) | B (Ti) |
|----------------|--------|--------|--------|--------|---------|--------|--------|
| Octave A | 523 | 587 | 659 | 698 | 784 | 880 | 987 |
| Octave B | 1047 | 1175 | 1319 | 1397 | 1568 | 1760 | 1975 |

Your mandate:

Develop and carry out a process that will allow you to adjust the frequency of the sound generated by the glass so it corresponds to a note on the scale (see the table on previous page).

How can you change the frequency of the sound generated by the glass? How to make the sound higher or lower?



Suggest an explanation (Hypothesis)

| | | | |
|-----|---|------------------------------|--|
| Cr1 | Appropriate representation of the situation | Reformulation of the problem | |
| | | Formulation of hypotheses | |



Planning and implementing the process

Equipment at your disposal:



Wine glasses
(various characteristics)



Wash bottle
filled with
water



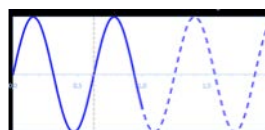
PC or Mac
Android tablet or
phone
iPad, iPod or iPhone



Eye-dropper



Beaker



Frequency
Analyzer
App

Based on the supplied equipment, plan the process:

- If you must change the elements as you go along, use a different colour pencil to adjust and annotate your initial plan.

Note: You may use the space available on the next page as needed.

Planning the process (continued):

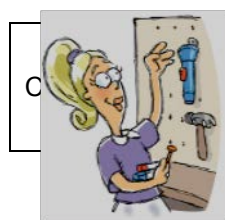
- If you must change the elements as you go along, use a different colour pencil to adjust and annotate your initial plan.

| | | | |
|-----|--|--|--|
| Cr2 | Development of a suitable plan of action | Planning of steps in the plan of action (manipulations, diagram of the assembly, etc.) | |
| | | Selection of resources (materials, equipment, etc.) | |
| Cr3 | Appropriate implementation of the plan of action | Observance of safety rules | |
| | | Use of appropriate strategies and techniques | |



Data

Note, organise, process the data.



C

the implementation
of action

Recording of data


Use appropriate types of representation (tables, graphs)



Difficulties and adjustments

Note what you experienced

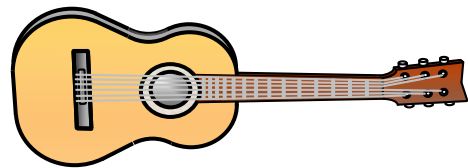
| Difficulties encountered | Adjustments made |
|--------------------------|-------------------------|
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| | | | |
|--|---------------------|---|--|
|  | presentation of the | Adjustments during the implementation of the plan of action | |
| <p style="text-align: center;"><i>Working out explanations and concluding</i></p> | | | |

Is your hypothesis confirmed or refuted? Confirmed Refuted

Why? Explain your choice based on your results and observations.

What parallels can you draw between what you discovered and one musical instrument that you know (tam-tam, xylophone, guitar, harmonica, recorder, etc.)?



| | | | |
|-----|--|---|--|
| Cr4 | Development of relevant explanations, solutions or conclusions | Verification of consistency of the hypothesis with the analysis of the results | |
| | | Formulation of explanations or conclusions in accordance with the data collected and knowledge acquired | |
| | | Suggestions for improvement | |
| | | Use of appropriate terminology, rules and conventions | |