**Year 8 Physical Science**

**Pendulum Energy Investigation**

In this activity, you are going to use a simple pendulum to try and develop your understanding of the processes involved.

The observations you are going to make are about the "period" of a pendulum.

The period of a pendulum, is the time taken for the pendulum to make one complete swing forwards and backwards to its starting position.



The equipment you will need for this activity:

* retort stand,
* string (about 1 m)
* boss-head with clamp
* set of 4 brass weights
* ruler
* tape and
* a timer



**Masking taped to bench**

When you are told to do so, set up your equipment as shown in the diagram at the right. Make the string 30cm long and use four weights on the spindle.

Pull the weights to one side so that when released, it will be able to swing freely back and forth without hitting anything.

After watching the pendulum swing 10 or so times, use your knowledge of potential and kinetic energy to describe the following.

The pendulum has its:

Greatest potential energy when: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Greatest kinetic energy when: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The speed of the pendulum is greatest when. it is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The speed of the pendulum is zero when. it is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If allowed to continue swinging would the pendulum stay swinging forever? Explain your answer.

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Can the pendulum be used to explain the Law of Conservation of Energy? Explain.

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Now complete the two tests below.

**Test 1**

Get your timer ready, then pull the weight back a distance of ten centimeters from the vertical.

Making sure that the weight will swing without hitting anything, let the weight go and start the .timer at the same instant.

Allow the weight to complete ten full swings, and stop the timer at the end of the tenth swing. Record the time for the ten swings in the table below under Trial 1 for Test 1. Repeat the timing twice more, recording the times under Trial *2* and 3. Average the three times, recording the average in the column titled average. Lastly, divide the average time by ten which will give the time for one swing, that is, the period for the pendulum you have constructed.

**Test 2**

Change the length of the string to 60 cm and remove two of the brass weights. This time, pull the weight back 20 cm from the vertical position and do three timings of ten swings, recording the times as Trials 1, 2and 3 for Test 2 in the table. Average the times then divide by ten to calculate the period for this pendulum,

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| --- | --- | --- | --- | --- | --- |
| **TEST** | **TRIAL 1** | **TRIAL 2** | **TRIAL 3** | **AVERAGE** | **PERIOD** |
| 1 |  |  |  |  |  |
| 2 |  |  |  |  |  |

**Questions**

1. Is there any difference in the period for Test 1 and Test 2? If there was a difference, what was the difference?

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1. If you found a difference in the periods, what do you think caused it?

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1. Can you be certain that what you have said caused the difference actually caused the difference. If not, why not?

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1. Check with the other groups what their periods were. Are they all the same? Why do you think this is so?

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1. What are the features (variables) of the pendulum that you could make changes to, to see if they have an effect on the period?

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1. Can you describe what you would need to do to investigate what caused the change in the period of your pendulum? Include in your description your independent variable, the dependent variable and any other variables that you would need to control.

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