Writing Assignment: Conservation of Energy

Physics 1

Mr. Bigler

The Assignment

When we did the bowling ball pendulum activity that illustrates conservation of energy, you observed how gravitational potential energy is converted to kinetic energy, and back to potential. Your assignment is to write a paper that explains and illustrates how this works.

In the introduction of your paper:

- Give a definition of energy (in the physics sense).
- Define gravitational potential energy \((U_g)\) and kinetic energy \((K)\), and give the equations for each.

In the main body of your paper:

- Explain the concept of conservation of energy (in the physics sense).
- Give a detailed explanation of how gravitational potential energy is converted to kinetic energy and vice versa as the bowling ball swings.
- Use the quantities from the bowling ball pendulum activity as a problem that illustrates how conservation of energy works. To do this, you need to give a narrative discussion of the problem. This means you need to perform the following calculations and also explain each step in words:
  1. Calculate the gravitational potential energy of the bowling ball when it is by your nose, using the following numbers:
     - The mass of the bowling ball is 7.25 kg.
     - The maximum height of the bowling ball is the distance from the floor to your nose (which you will need to measure, in meters) minus 0.15 m (the height from the floor to the center of the bowling ball when it is hanging from the chain).
  2. Calculate the maximum velocity of the bowling ball by assuming that all of the gravitational potential energy is converted to kinetic energy, and solving for \(v\).
  3. Calculate the velocity of the bowling ball when it is 0.2 m away from your nose. This means:
     - Subtract 0.2 m from the maximum height and use that height to calculate the gravitational potential energy of the bowling ball at that point.
     - Based on conservation of energy, calculate the velocity of the bowling ball at that point.

In the conclusion of your paper:

- Summarize your calculation process in one sentence. (Be sure to include the velocity you calculated when the bowling ball was 0.2 m from your face and use that to explain why it was so scary.)
- Give examples of other problems that you could solve or questions that you could answer using conservation of energy.
Grading
This paper will be graded using the Ideas & Content and Organization traits from the Six Traits rubric:

<table>
<thead>
<tr>
<th>Ideas &amp; Content</th>
<th>6 Exemplary</th>
<th>5 Strong</th>
<th>4 Proficient</th>
<th>3 Developing</th>
<th>2 Emerging</th>
<th>1 Beginning</th>
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<tbody>
<tr>
<td>• main theme</td>
<td>• Excepti-</td>
<td>• Clear, focused, interesting ideas with appropriate detail</td>
<td>• Evident main idea with some support which may be general or limited</td>
<td>• Main idea may be cloudy because supporting detail is too general or even off-topic</td>
<td>• Purpose and main idea may be unclear and cluttered by irrelevant detail</td>
<td>• Lacks central idea; development is minimal or non-existent</td>
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<tr>
<td>• supporting details</td>
<td>onally clear, focused, engaging with relevant, strong supporting detail</td>
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<table>
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<tr>
<th>Organization</th>
<th>6 Exemplary</th>
<th>5 Strong</th>
<th>4 Proficient</th>
<th>3 Developing</th>
<th>2 Emerging</th>
<th>1 Beginning</th>
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<tbody>
<tr>
<td>• structure</td>
<td>• Effectively organized in logical and creative manner</td>
<td>• Strong order and structure</td>
<td>• Organization is appropriate, but conventional</td>
<td>• Attempts at organization; may be a “list” of events</td>
<td>• Lack of structure; disorganized and hard to follow</td>
<td>• Lack of coherence; confusing</td>
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<tr>
<td>• introduction</td>
<td>• Inviting intro and satisfying closure</td>
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<tr>
<td>• conclusion</td>
<td>• Creative and engaging intro and conclusion</td>
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Translations of Six Traits scores to grades will be based on the following conversion chart:

<table>
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<th>Points</th>
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<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
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<td>97</td>
<td>93</td>
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<td>70</td>
<td>65</td>
<td>60</td>
<td>30</td>
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</tbody>
</table>
Formatting in Google Documents

“I don’t know how to do subscripts or equations on the computer.” is not an acceptable excuse for not doing these things correctly.

Subscripts & Superscripts

Select the text that you would like to turn into a subscript. Then select Format → Text → Subscript for subscripts, or Format → Text → Superscript for superscripts.

Section Headings

This paper does not need section headings, but if you were writing something like a lab report you would need them. To turn text into a heading, select the text and then select Format → Normal Text ▼ → Heading # (where “#” is the size of the heading that you want.)
Equations

Inserting an equation is a two-step process.

First, you need to insert the equation template by selecting Insert → Equation:

Then you need to place each part of the equation in the correct place.

For fractions, select \( \frac{a}{b} \) and then click the mouse to type the numerator and denominator. If the fraction comes out ridiculously small, change the font size of the entire equation. If your document is 11pt, fractions look reasonably good in 18pt.

For variables with subscripts (such as \( v_0 \)), select \( x_a \) and use the mouse to separately select the variable and the subscript.

For radicals, select \( \sqrt{x} \) and then click the mouse to type inside the radical.