PENGUINS - A DIRECT CURRENT CURRENT MODEL
A CAPE-tech Physics Laboratory Activity

Procedures:

1. Measure the mass of a single penguin.
2. Determine the total change in elevation of a penguin as it moves from the bottom of the stairs to the top of the stairs.
3. Determine the number of penguins which pass a specific point of the toy in one minute.

Data:

Mass of a penguin ( )	Total Height of Stairs ( )	Number of penguins/minute

Calculations & Questions: Show all equations used, and show your work.

1. Determine the potential energy increase given to each penguin as the penguin "climbs" the stairs.

2. In MTUs (i.e., Mixed Toy Units), the unit of charge will be the "penguin." The path the penguins follow is the "circuit". What is the "current" in penguins/second?

3. The penguins can make it around the circuit only when circuit is (open, closed). _____

4. Going up stairs, the penguins (gain, lose) _____ potential energy, and going down the slide they (gain, lose) _____ potential energy. In an analogy to an electric circuit, then, the stairs would represent the (battery, load [for example, a resistor]) _____, and the slide would be the (battery, load) _____.

5. In step 1 of this section , you calculated the energy gained by each penguin going up the stairs. This "energy per penguin" is an analog of (current, voltage, power) _____ in an electric circuit.

6. Use the answers to steps 2 and 5 of this section to find the energy transformed from potential energy to thermal, kinetic, and acoustical energy every second by penguins going down the slide.

7. In an electric circuit the answer to part 6, above, is called _____ , and the units of measure are _____.

8. Imagine a point "H" half-way down the slide. Consider a point "a" just before "H", and a point "b" just after point "H". How does the number of penguins/second passing point "a" compare to the number of penguins/second passing point "b"? Explain your answer.

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9. Would penguins passing point "a" have more or less potential energy than penguins passing point "b"? Explain your answer.

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10. Since point "a" is closer to the top than the bottom of the slide, would penguins give up more potential energy going from the top to point "a" or going from point "a" to the bottom?

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11. Recall that point "H" is halfway down the slide. The potential energy given up by a penguin from point "H"on, plus the potential energy given up between the top and point "H" must be equal to

_____

12. In a (series, parallel) _____ circuit, the current is always the same at each point along the circuit, and the_____across the loads must add up to the _____.

13. What kind of electric circuit does the penguin toy illustrate? (series, parallel) _____.

14. Point "T" is at the top of the stairs. Suppose there were two slides with equal paths for the penguins to go down from point "T". Equal numbers of penguins would go down each slide, assuming a random distribution. In that case, there would be (more, less, the same number of) _____ penguins going down each slide per second.

15. The number of penguins/second passing point "T" would have to equal the sum of _____.

16. The potential energy available per penguin going down one slide would be the equal to potential energy available per penguin going down the other slide. This relationship is analogous to the fact that in a (series, parallel) _____ circuit the _____ is the same across each branch of the circuit.

17. In a _____ circuit, the currents in each branch must add up to the total current feeding that circuit.