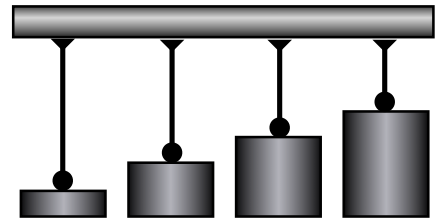# NAILED!

A VIDEO DEMONSTRATION OF ENERGY TRANSFORMATIONS
Physics Cinema Classics: Nails into Wood

Name:_____ Per:_____ Date:_____

Iron cylinders suspended with electromagnets will be allowed to fall on nails that are partially driven into wood. The cylinders have masses of 4 kg, 8 kg, 12 kg, and 16 kg. They are suspended at the same height.

1. a. What kind of energy do the cylinders have when they are suspended above the nails?

b. What energy transformation occurs as the cylinders fall?

c. What energy transformations occur when the cylinders strike the nails?
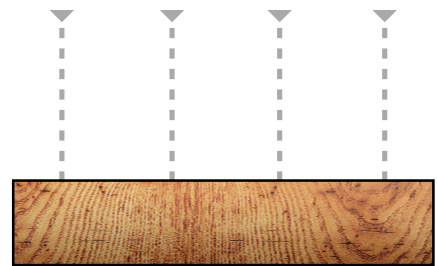
2. THE FIRST DEMONSTRATION
How far will each nail be driven into the wood?
a. The nails are shown in their initial positions in the figure above to the right. Predict the position of the nails after they've been struck by the weights. Sketch your prediction on the figure.

b. Observe the demonstration. If the result differs from your prediction, make appropriate corrections.

c. Which cylinder strikes its nail with the greatest impact speed? Justify your answer.

d. What—if anything—would have been different about the demonstration if it had been done on the moon ($g = 1.6$ m/s^2)?

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3. THE SECOND DEMONSTRATION

Four weights with equal masses are suspended at different heights above the nails. One is 1 m high, one is 2 m high, one is 3 m high, and one is 4 m high.

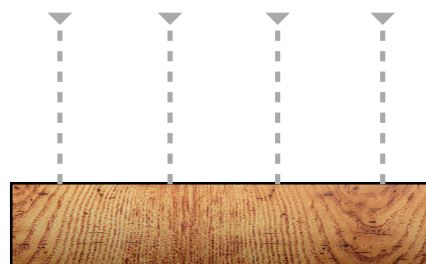How far will each nail be driven into the wood?
a. Show your prediction by sketching the nails on the board shown to the right. Justify your prediction below.
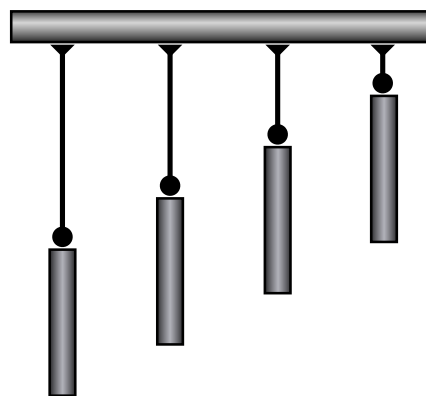
b. There are at least two ways that the same bodies dropped from the same heights could have driven the same nails to greater depths. What are they?

i.

ii.

4. After a demonstration (involving four falling masses) we didn't see, the nails were found as shown below. Draw the masses before the demonstration and describe two arrangements that could have given this result (using only the apparatus used in the previous demonstrations).

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