Tipper #2 -unit4

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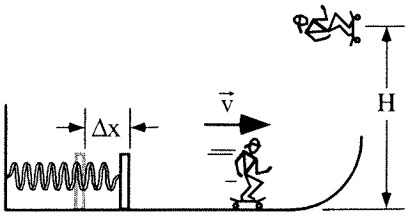
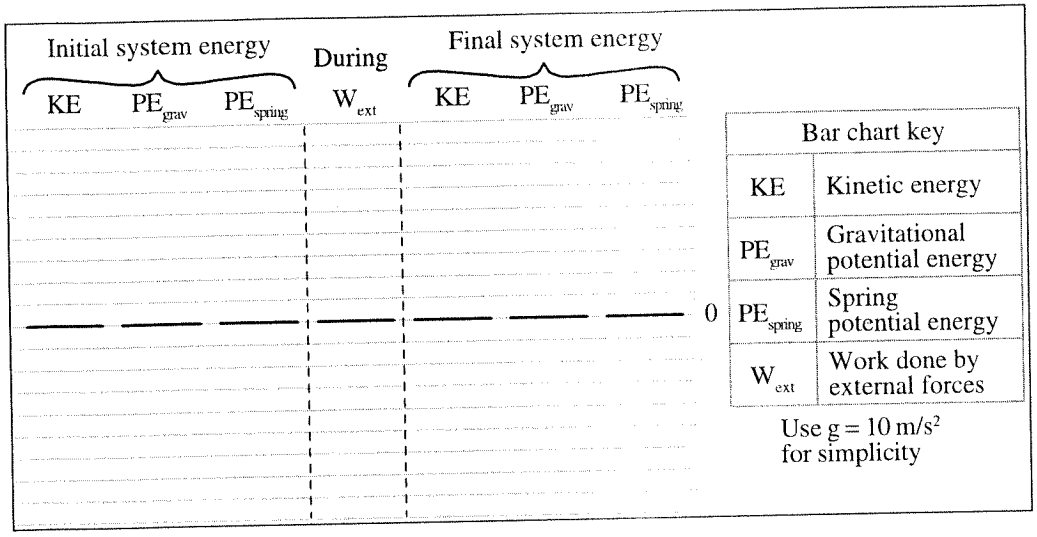
#1

B4-BCT38: SKATEBOARDER LAUNCHED BY A SPRING II—ENERGY BAR CHART

A performer on a skateboard is launched by a spring initially compressed a distance Δx as shown. His speed on the horizontal portion of the ramp is v, and he rises to a height H after he leaves the ramp. Ignore friction effects.



Draw an energy bar chart for the earth- skateboarder-spring system as he goes from the compressed spring position at rest to when he reaches the height H. Put the zero point for the gravitational potential energy at the initial height of the performer before launching.

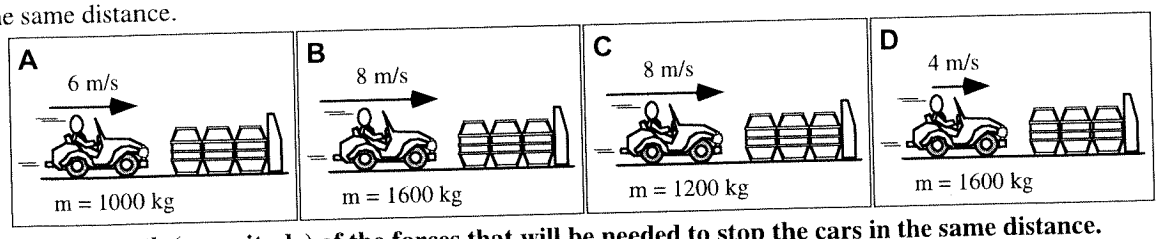


Explain your reasoning.

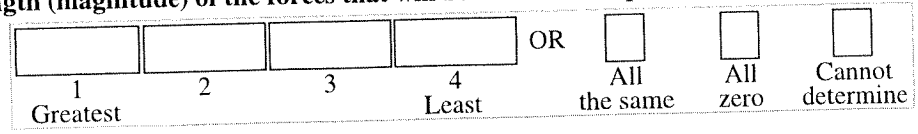
#2.

B4-RT04: CARS AND BARRIERS—STOPPING FORCE IN SAME DISTANCE

Cars that are moving along horizontal roads are going to be stopped by plowing into barrel barriers. All of the cars are the same size and shape, but they are carrying loads with different masses. All of the cars are going to be stopped in the same distance.



Rank the strength (magnitude) of the forces that will be needed to stop the cars in the same distance.



Explain your reasoning.

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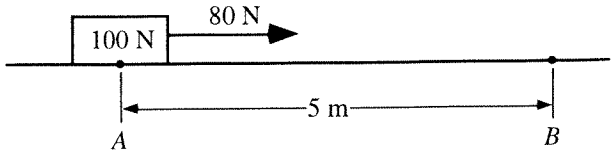
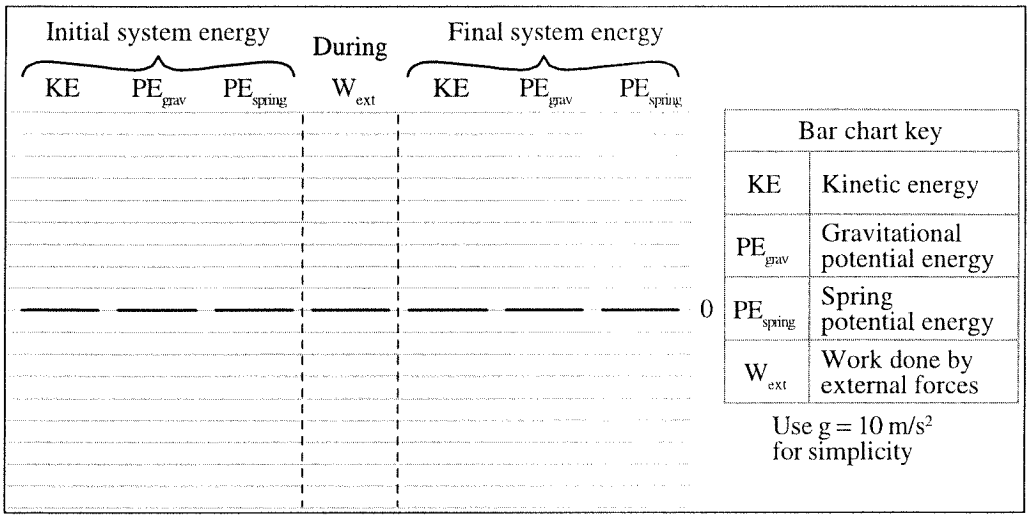
#3

B4-BCT31: Box Pulled on Rough Surface—Energy Bar Chart

A 100-N box is initially at rest on a rough, horizontal surface where the friction force is 40 N. A student applies a horizontal force of 80 N to the right on the box as shown. The box starts at rest at point *A*.



Complete the energy bar chart for the earth-box system before and after the box has moved a horizontal distance of 5.0 m. Put the zero point for the gravitational potential energy at the surface.



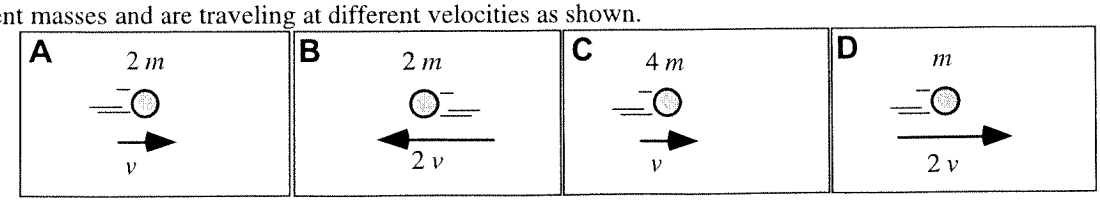
Explain your reasoning.

#4

B4 Work and Energy

B4-RT01: Moving Balls I—Kinetic Energy

In the figures below, balls are traveling in different directions. The balls have the same size and shape, but they have different masses and are traveling at different velocities as shown.



Rank the kinetic energy of the balls.

				OR			
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

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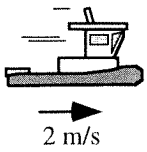
#5

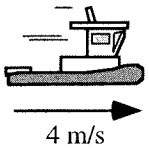
B4-BCT14: Tugboat Changing Velocity I—Work & Kinetic Energy Bar Chart

(a) The velocity of a tugboat increases from 2 m/s to 4 m/s in the same direction while a force is applied to the tugboat for 20 seconds.

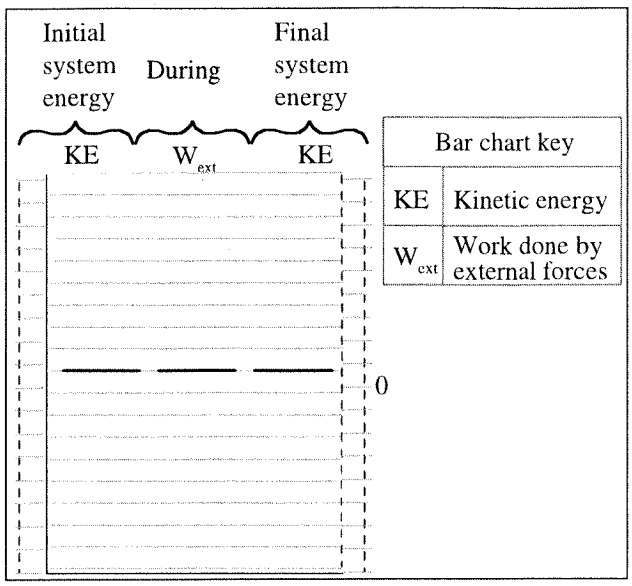
Complete the work and kinetic energy bar chart for this process. The bar heights should be in correct proportion to one another.



20 seconds later:

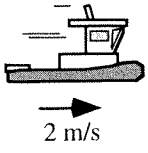


Explain.

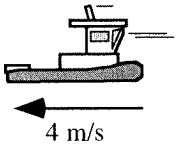


(b) The velocity of a tugboat changes from 2 m/s to 4 m/s in the opposite direction while a force is applied to the tugboat for 20 seconds.

Complete the work and kinetic energy bar chart for this process. The bar heights should be in correct proportion to one another.

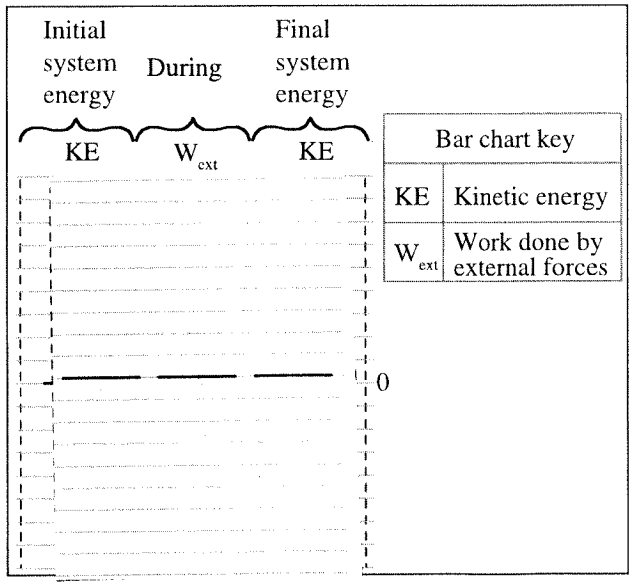


20 seconds later:



Explain.

Answers (a) and (b) will have the same bar chart graphs. In both cases, the speed of the tugboat doubles and so the kinetic energy quadruples. In both cases, the same net work will have been done on the tugboat.



Tipper # 2 - Unit 4

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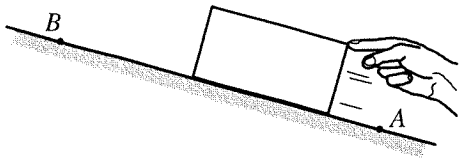
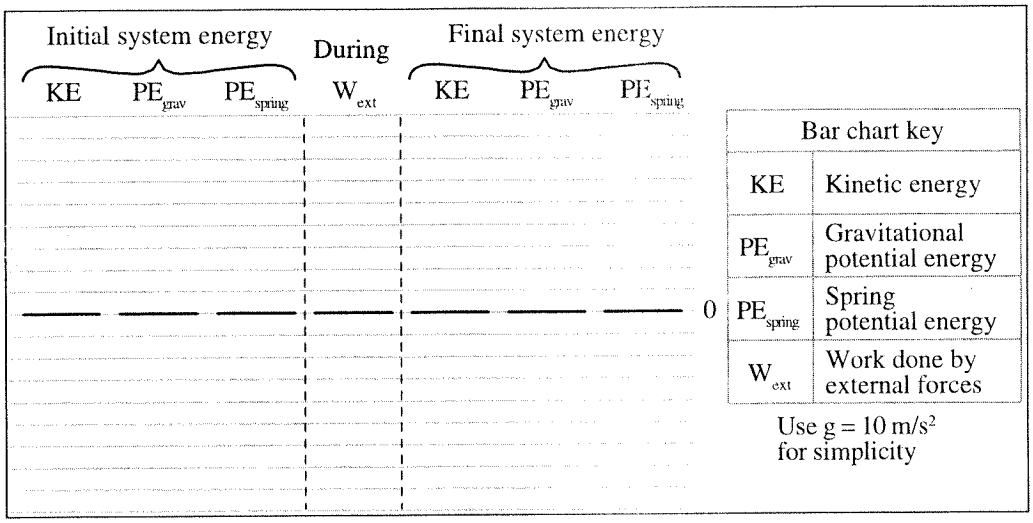
#6

B4-BCT29: Block Pushed on Smooth Ramp—Energy Bar Chart

A block is pushed so that it moves up a smooth (frictionless) ramp at constant speed from *A* to *B*.



Complete the energy bar chart for the earth-block system as the block moves from point *A* to *B*. Put the zero point for the gravitational potential energy at *A*.

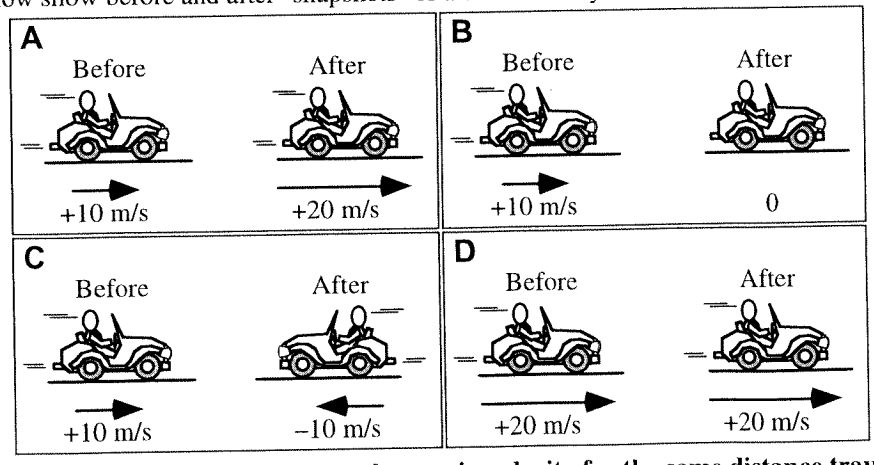


Explain your reasoning.

#7

B4-RT06: Cars Changing Velocity—Work Done

The situations below show before and after "snapshots" of a car's velocity. All cars have the same mass.



Rank the work done on the cars to create these changes in velocity for the same distance traveled.

				OR			
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

Tipper #2 - Unit 2

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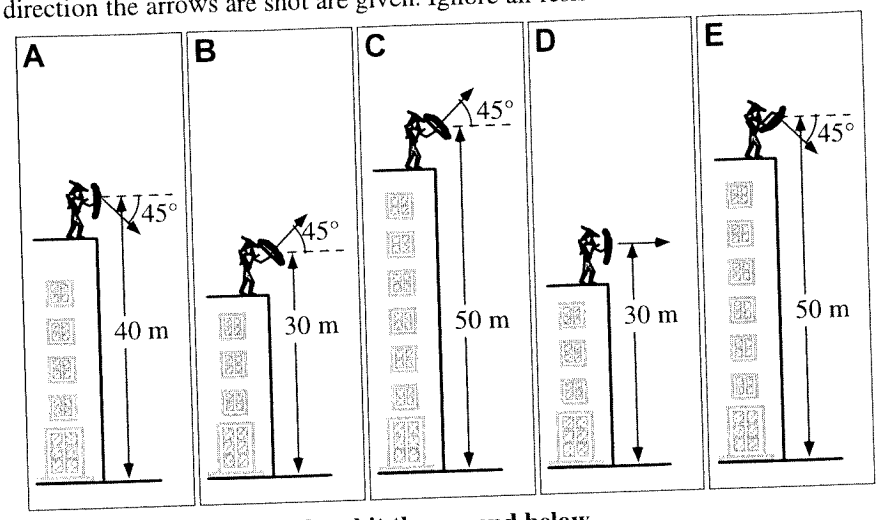
#8 B4-RT25: Arrows Shot from Buildings—Final Speed

In each case below, an arrow has been shot from the top of a building either up at a 45° angle, straight out horizontally, or down at a 45° angle. All arrows are identical and are shot at the same speed, and the heights of the buildings and the direction the arrows are shot are given. Ignore air resistance.



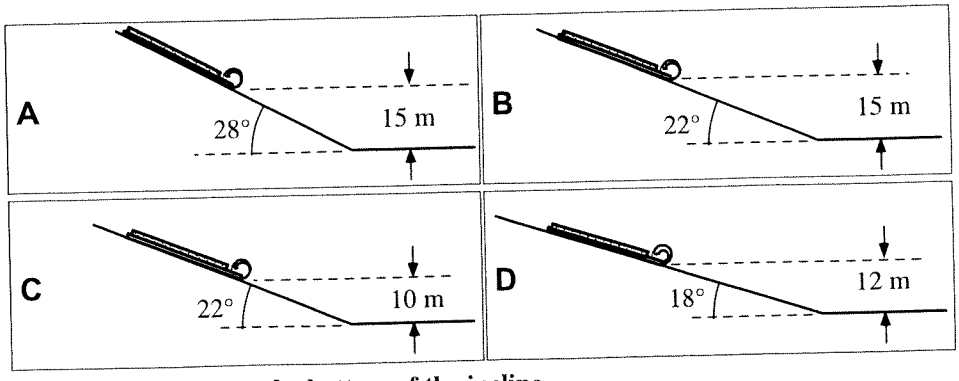
Rank the speed of the arrows just before they hit the ground below.

					OR			
						☐	☐	☐
1 Greatest	2	3	4	5 Least		All the same	All zero	Cannot determine

Explain your reasoning.

#9 B4-RT26: Toboggans Going Down Slippery Hills—Speed at Bottom

In each case below, a toboggan starts from rest and slides without friction down a snowy hill. The toboggans are all identical, and the starting heights (vertical distance above the flat bottom of the incline) and angles of the hills are given.



Rank the speed of the toboggans at the bottom of the incline.

				OR			
					☐	☐	☐
1 Greatest	2	3	4 Least		All the same	All zero	Cannot determine

Explain your reasoning.

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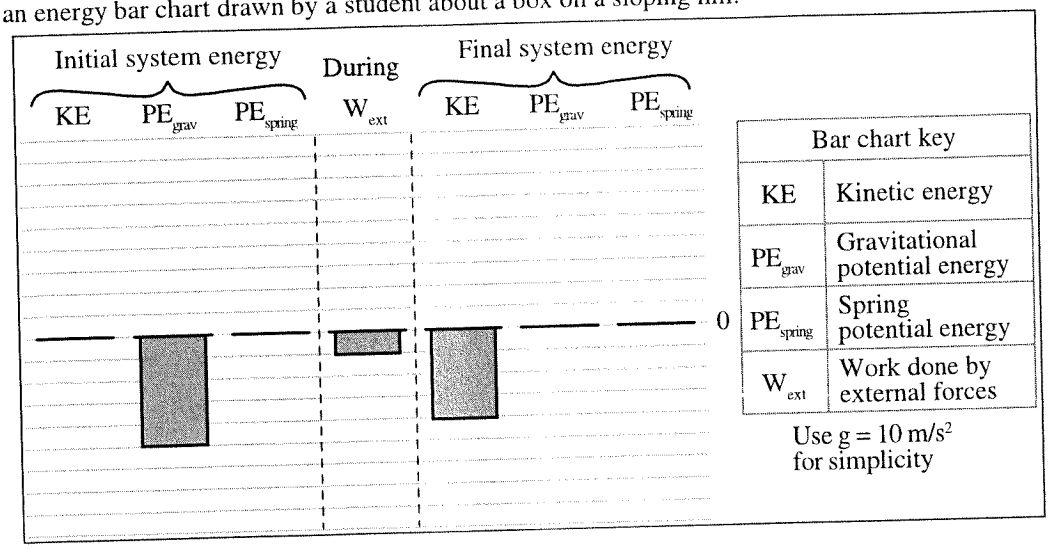
#10

B4-WWT42: Box on Sloping Hill—Energy Bar Chart

Shown is an energy bar chart drawn by a student about a box on a sloping hill.



A second student says:

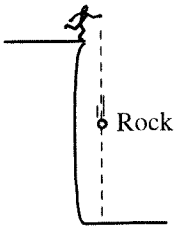
"No, this is not correct since the work done must be positive."

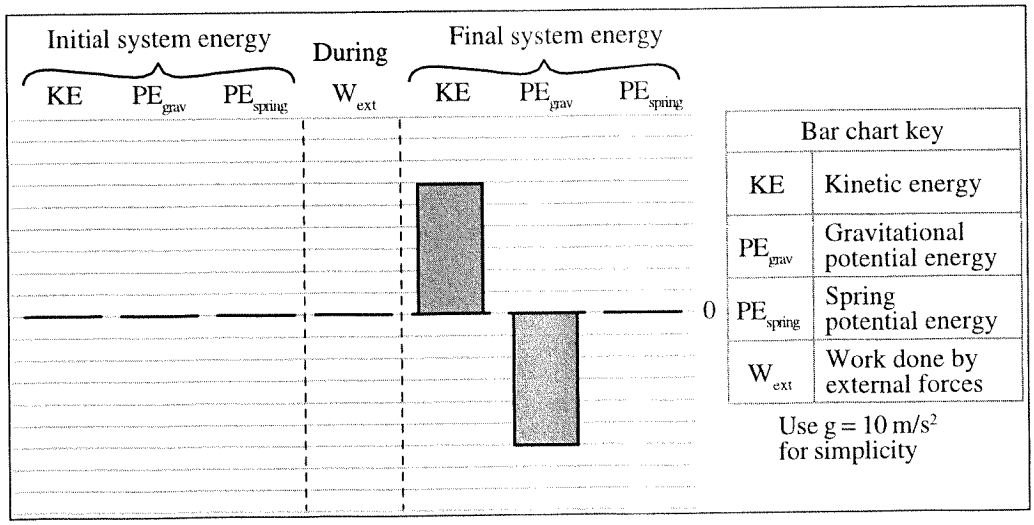
What, if anything, is wrong with this chart? If something is wrong, identify it and explain how to correct it. If this statement is correct, explain why.

#11

B4-QRT43: Dropped Rock—Energy Bar Chart

A rock is dropped by a student from the top of a cliff and falls straight to the ground below. He constructs an energy bar chart shown below using a coordinate system in which the positive vertical direction is up and the origin of the coordinate system is the release point of the rock which is also selected as the zero point for the gravitational potentials energy.





Draw a new energy bar chart for this event but use the ground as the zero point for the potential gravitational energy.