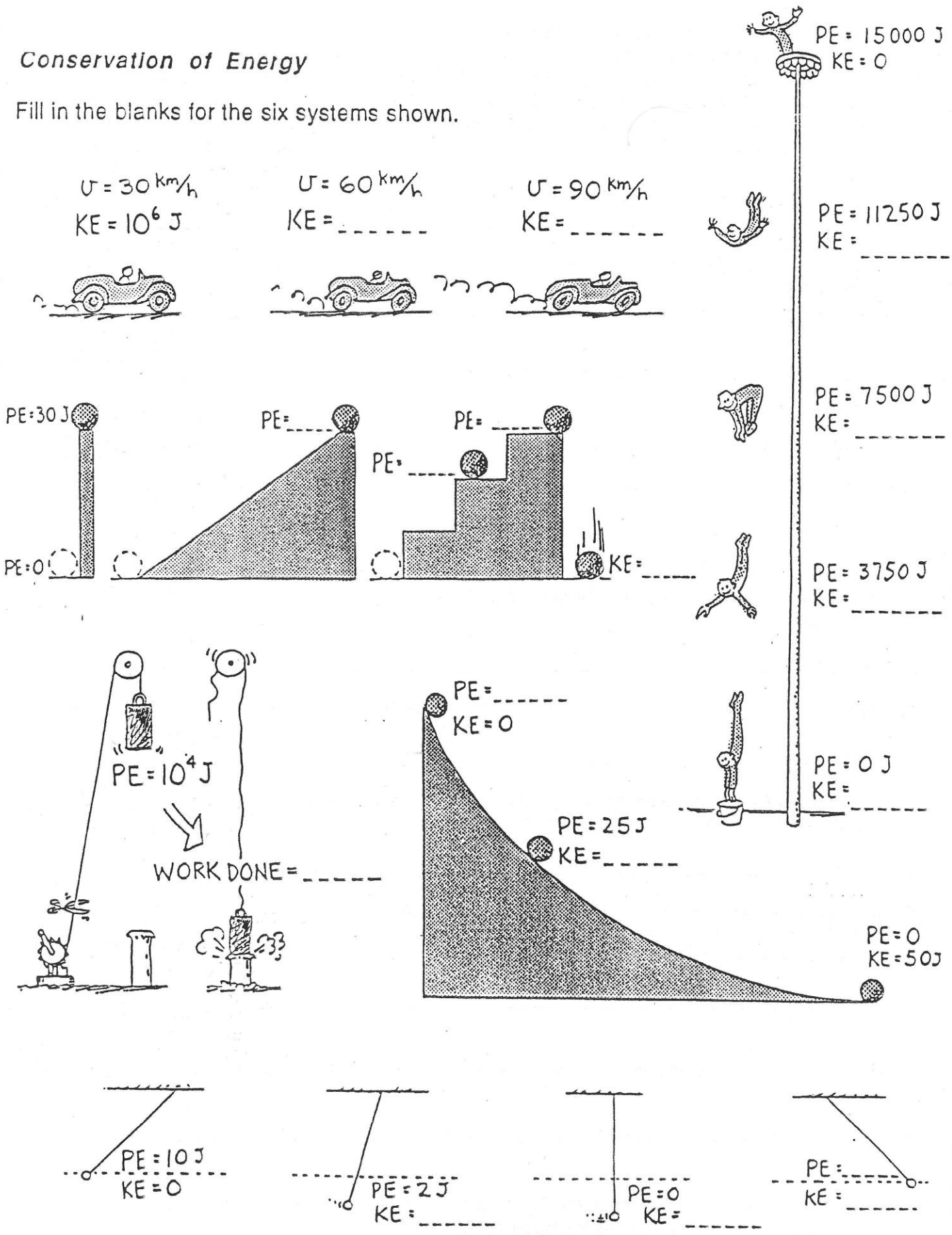
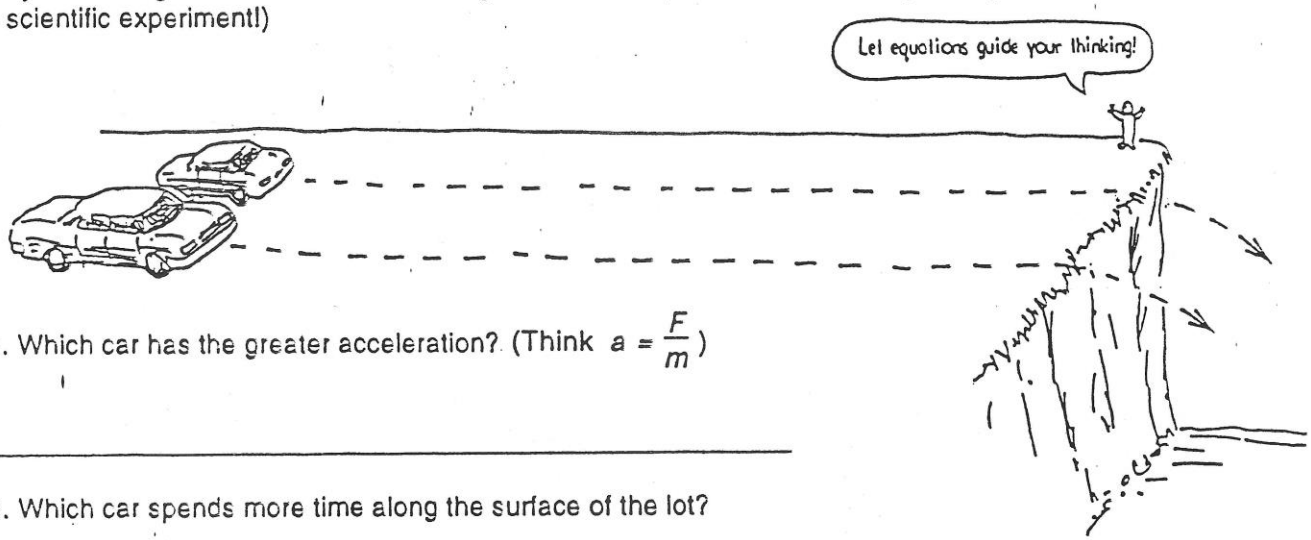
Conservation of Energy

Fill in the blanks for the six systems shown.



A Honda Civic and a Lincoln Town Car are initially at rest on a horizontal parking lot at the edge of a steep cliff. For simplicity, we assume that the Town Car has twice as much mass as the Civic. Equal constant forces are applied to each car and they accelerate across equal distances (we ignore the effects of friction). When they reach the far end of the lot the force is suddenly removed, whereupon they sail through the air and crash to the ground below. (The cars are beat up to begin with, and this is a scientific experiment!)



1. Which car has the greater acceleration? (Think $a = \frac{F}{m}$)

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2. Which car spends more time along the surface of the lot?

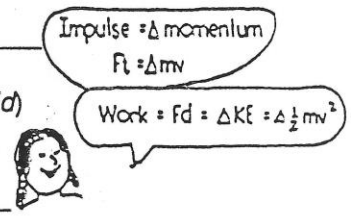
_____

3. Which car has the larger impulse imparted to it by the applied force? (Think Impulse = Ft)
   Defend your answer.

_____

4. Which car has the greater momentum at the edge of the cliff? (Think $Ft = \Delta mv$) Defend your answer.

_____



5. Which car has the greater work done on it by the applied force? (Think $W = Fd$)
   Defend your answer in terms of the distance traveled.

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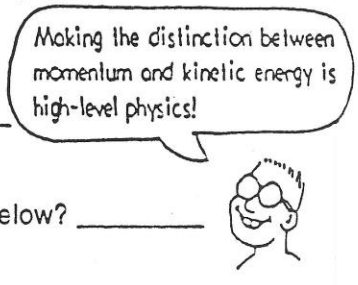
6. Which car has the greater kinetic energy at the edge of the cliff? (Think $W = \Delta KE$)
   Does your answer follow from your explanation of 5?
   Does it contradict your answer to 3? Why or why not?

_____



7. Which car spends more time in the air, from the edge of the cliff to the ground below? _____

8. Which car lands farthest horizontally from the edge of the cliff onto the ground below? _____

Challenge: Suppose the slower car crashes a horizontal distance of 10 m from the ledge.
Then at what horizontal distance does the faster car hit?