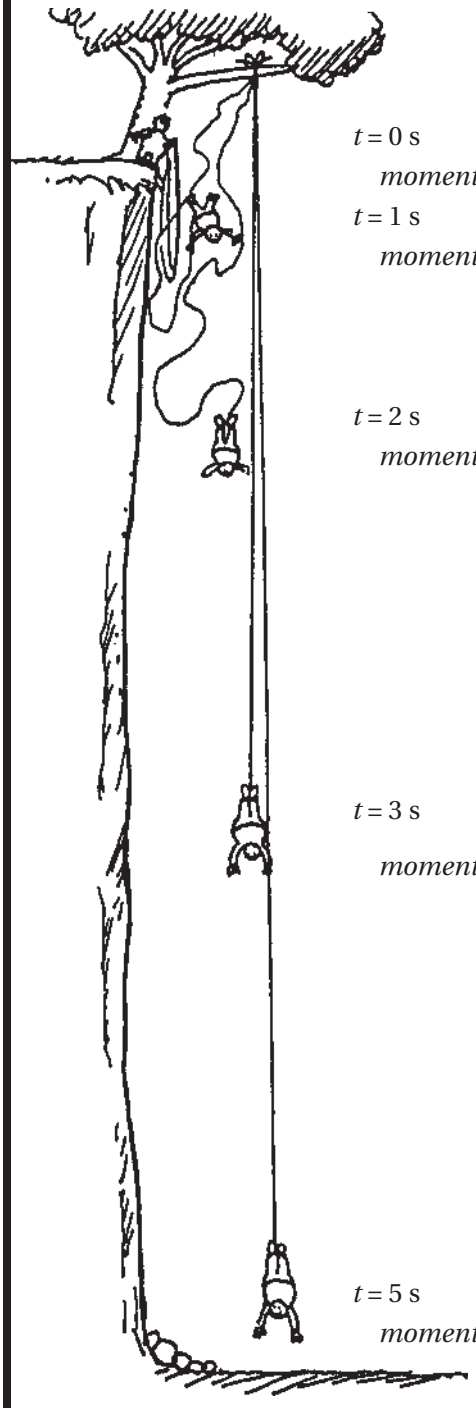
Name _____ Class _____ Date _____

Concept-Development Practice Page 9-3

Momentum and Energy



$t = 0$ s $v =$ _____

momentum = _____

$t = 1$ s $v =$ _____

momentum = _____

$t = 2$ s $v =$ _____

momentum = _____

$t = 3$ s $v =$ _____

momentum = _____

$t = 5$ s $v =$ _____

momentum = _____

Bronco Brown wants to put $Ft = \Delta mv$ to the test and try bungee jumping. Bronco leaps from a high cliff and experiences free fall for 3 seconds. Then the bungee cord begins to stretch, reducing his speed to zero in 2 seconds. Fortunately, the cord stretches to its maximum length just short of the ground below.

Fill in the blanks. Bronco's mass is 100 kg. Acceleration of free fall is 10 m/s^2.

Express values in SI units (*distance* in m, *velocity* in m/s, *momentum* in kg·m/s, *impulse* in N·s, and *deceleration* in m/s^2).

The 3-s free-fall distance of Bronco just before the bungee cord begins to stretch

= _____.

Δmv during the 3-s interval of free fall

= _____.

Δmv during the 2-s interval of slowing down

= _____.

Impulse during the 2-s interval of slowing down

= _____.

Average force exerted by the cord during the 2-s interval of slowing down

= _____.

How about *work* and *energy?* How much KE does Bronco have 3 s after his jump?

_____

How much does gravitational PE decrease during this 3 s?

_____

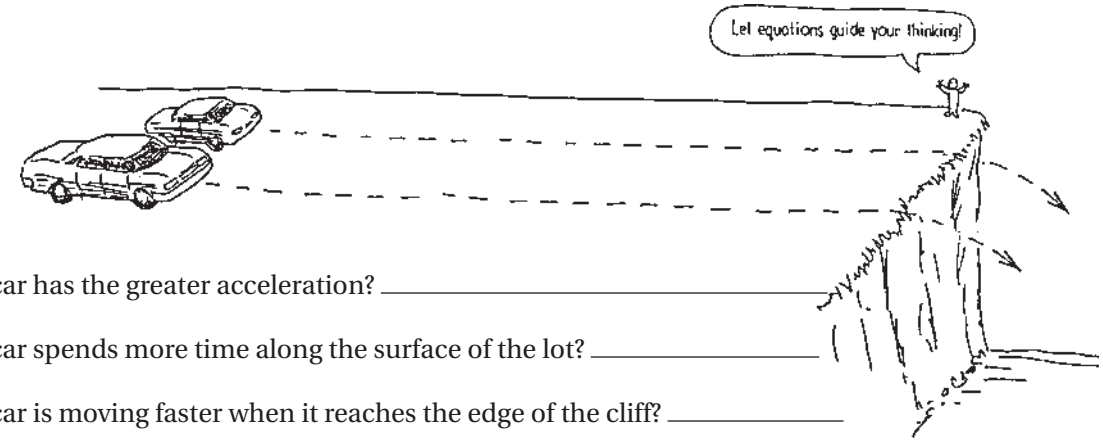
What two kinds of PE are changing during the slowing-down interval?

_____

CONCEPTUAL PHYSICS

Energy and Momentum

A compact car and a full-size sedan are initially at rest on a horizontal parking lot at the edge of a steep cliff. For simplicity, we assume that the sedan has twice as much mass as the compact car. 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? _____

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

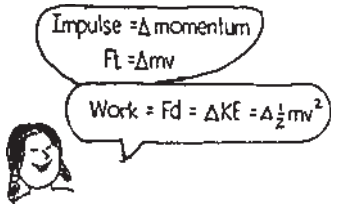
3. Which car is moving faster when it reaches the edge of the cliff? _____

4. Which car has the larger impulse imparted to it by the applied force? Defend your answer.

   _____

5. Which car has the greater momentum at the edge of the cliff? Defend your answer.

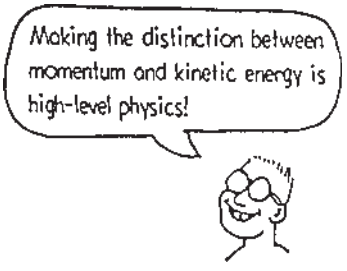
   _____



6. Which car has the greater work done on it by the applied force? Defend your answer in terms of the distance traveled.

   _____

   _____



7. Which car has the greater kinetic energy at the edge of the cliff? Does your answer follow from your explanation of 6? Does it contradict your answer to 4? Why or why not?

   _____

   _____

   _____

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

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

10. 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?

    _____

    _____

CONCEPTUAL PHYSICS