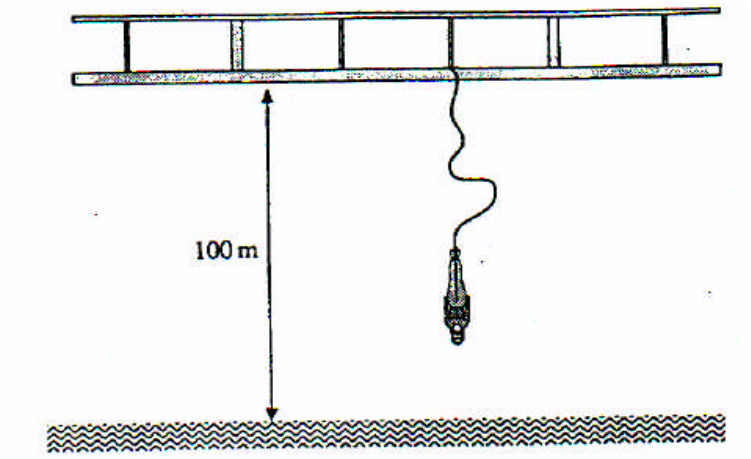
Chapter 9
Short answer question

This question is about the sport of bungee jumping.



A girl of mass 50 kg jumps from a bridge 100 m above a river. Attached to her ankles is an elastic rope of natural length 50 m. The rope extends as she falls and brings her to a momentary halt 10 m above the water surface.

(a) Describe the energy transfers which occur from the time the girl jumps until she first comes to rest.

(b) At what point during the jump does the elastic rope exert the greatest force on the girl? Explain your answer.

(c) A relative of the girl, observing the jump, thought this activity was far too dangerous, since the decelerating force on the girl was so large.

(i) Estimate the energy stored in the rope when the girl first comes to rest 10 m above the water.
(g = 9.8 Nkg^{-1})

(ii) Hence estimate the mean force exerted by the rope on the girl whilst bringing her to rest. Assume the rope obeys Hooke's Law.

(d) The organisers of the event have ropes with different values of force constant (k) where k is defined by Hooke's Law:

$$force = k \times extension$$

They match the rope to the weight of the person.

Discuss what would happen if the force constant of the rope were:

(i) too large,

(ii) too small.