2 Fig. 2.1 shows a person of mass 70 kg doing a bungee jump.

Fig. 2.1

The bungee rope has negligible mass and has an unstretched length of 50 m. This bungee rope may be assumed to obey Hooke's law. A force of 200 N extends the bungee rope by 2.5 m. The bungee rope is secured to the feet of the person. The person leans over a bridge above the river and drops vertically downwards towards the river below. You may assume that air resistance is negligible.

(a) Sketch a graph of the tension *T* in the bungee rope against its total length *l*.

[2]

(b) Show that the elastic potential energy in the bungee rope is directly proportional to the square of its extension *e*.

[2]

(c) Determine the elastic potential energy in the bungee rope when the person has reached the lowest point of his jump.

elastic potential energy = ... J [3]

(d) Explain why it would be extremely dangerous to have a bungee rope that is much stiffer.

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[1]

[Total: 8]