

Hooke's Law - Exercises (2 pages; 30/1/19)

(1) A particle of mass 200g is attached at the mid-point of an elastic string of natural length 0.5m and modulus of elasticity λ , which hangs vertically between two points, 1m apart.

- (i) How far will the particle be below the top point if $\lambda = 1$?
- (ii) Determine the minimum value of λ such that there is no slack in the string.

(2) A particle of mass 200g hangs at a point Q, suspended from a fixed point P, by means of a spring of original length 20cm and modulus of elasticity 5N. It is pulled down to a point R, which is 35cm below P. The particle is then released.

Ignoring any resistances to motion, find:

- (i) the work done in pulling the particle down to R
- (ii) the maximum speed of the particle after it is released, and the point at which this occurs
- (iii) the distance of the particle below P when it reaches its maximum height, at position S, and show that the distance QS equals the distance QR

(3) A bungee jumper of mass 80kg is attached to a rope of original length 10m and modulus of elasticity 1600N. How far will he or she fall? (Take $g=10$)

(4) Two elastic strings AB and BC are joined together at B, to form one long string. String AB has natural length $4m$ and modulus of elasticity $20N$; string BC has natural length $2m$ and modulus of elasticity $30N$. The ends A and C of the long string are attached to two fixed points which are $10m$ apart. Find the tension in the combined string.