4. A light elastic **spring**, of natural length $4a$ and modulus of elasticity $3mg$, has one end attached to a fixed point A.
A particle of mass m is attached to the other end of the spring. The particle hangs vertically below A.

The particle is pulled vertically downwards to the point B, where $AB = 7a$, and released from rest.
Air resistance is ignored.

(a) Find the acceleration of the particle at the instant it is released from rest.

(3)

(b) By considering energy, find in terms of g and a, the speed of the particle when it is a distance $5a$ below A.

(5)

The particle first comes to instantaneous rest at the point C, where $AC = ka$ and k is a constant.

(c) By considering energy, find the value of k.

(5)

(Total for Question 4 is 13 marks)