Leave blank

6. A light elastic string has natural length a and modulus of elasticity $\frac{3}{4}mg$. A particle P of mass m is attached to one end of the string. The other end of the string is attached to a fixed point A. Particle P hangs freely in equilibrium at the point O, vertically below A.

(a) Find the distance OA.

(2)

The particle P is now pulled vertically down to a point B, where $AB = 3a$, and released from rest.

(b) Show that, throughout the subsequent motion, P performs **only** simple harmonic motion, justifying your answer.

(6)

The point C is vertically below A, where $AC = 2a$.

Find, in terms of a and g,

(c) the speed of P at the instant that it passes through C,

(3)

(d) the time taken for P to move directly from B to C.

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Leave blank

Question 6 continued

Leave blank

Question 6 continued

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Leave blank

Question 6 continued

(Total 15 marks)

Q6