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6. A particle, P, of mass 0.4 kg is attached to the midpoint of a light elastic spring of natural length 0.8 m and modulus of elasticity 20 N. The ends of the spring are attached to the fixed points A and B on a smooth horizontal table, where $AB = 1.2$ m. Initially P is at rest at the midpoint O of AB where AOB is a straight line. The particle P now receives an impulse of magnitude 2 Ns so that P starts to move directly towards B.

(a) Prove that P moves with simple harmonic motion.

(4)

(b) Write down, in terms of π, the period of the motion.

(1)

(c) Find the amplitude of the motion.

(3)

(d) Find the length of time in each complete oscillation for which AP is greater than 0.5 m.

(5)

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