

- 4 (a) A load of mass 2.3 kg oscillates vertically with simple harmonic motion on the free end

of a spring of force constant  $63 \text{ N m}^{-1}$ . The amplitude of the oscillation is 0.28 m and the period  $T$  of the oscillation is given by the expression

$$T = 2\pi\sqrt{\frac{m}{k}}$$

where  $m$  is the mass of the load and  $k$  is the force constant.

- (i) Calculate the angular frequency  $\omega$  of the oscillation.

$$\omega = \dots \text{ rad s}^{-1} [2]$$

- (ii) Determine the maximum kinetic energy  $E$  of the oscillating mass.

$$E = \dots \text{ J} [2]$$

- (b) The potential energy of the oscillating system in (a) is partly gravitational potential energy and partly elastic potential energy.

Complete the following table to show the values of the various different forms of energy at the top, the middle and the bottom of the oscillation of the mass.

	kinetic energy/J	gravitational potential energy/J	elastic potential energy/J	total energy/J
top			-3.85	
middle		reference zero	reference zero	
bottom				