Question Number	Answer	Mark
20(a)	There is a (resultant) force that is proportional to the displacement from the equilibrium position **(1)** and (always) acting towards the equilibrium position **(1)** (Allow references to acceleration. An equation with symbols defined correctly is a valid response for both marks. For equilibrium position accept: undisplaced point/position or fixed point/position or central point/position.)	**2**
20(b)	**EITHER** Use of $F = mg$ **(1)** Use of $\Delta F = (-)k\Delta x$ **(1)** Use of $T = 2\pi\sqrt{\frac{m}{k}}$ **(1)** Use of $\omega = \frac{2\pi}{T}$ [Allow use of $\omega = \sqrt{\frac{k}{m}}$ for MP3 and MP4] **(1)** Use of $v = \omega x_0 \sin \omega t$ **(1)** $v_{max} = 0.34 \text{ m s}^{-1}$ **(1)** **OR** Use of $F = mg$ **(1)** Use of $\Delta F = (-)k\Delta x$ **(1)** Use of $\Delta E_{el} = \frac{1}{2}F\Delta x$ **(1)** Use of $E_k = \frac{1}{2}mv^2$ **(1)** Use of energy conservation **(1)** $v_{max} = 0.34 \text{ m s}^{-1}$ **(1)** [If $T = 2\pi\sqrt{\frac{\ell}{g}}$ is used, then correct answer scores 6 marks. If answer is incorrect, then credit **may** be obtained for MP1, MP2, MP4, MP5] <u>Example of calculation</u> $F = 0.150 \text{ kg} \times 9.81 \text{ N kg}^{-1} = 1.47 \text{ N}$ $k = \frac{1.47 \text{ N}}{7.5 \times 10^{-2} \text{ m}} = 19.6 \text{ N m}^{-1}$ $T = 2\pi\sqrt{\frac{0.150 \text{ kg}}{19.6 \text{ N m}^{-1}}} = 0.549 \text{ s}$ $\omega = \frac{2\pi \text{ rad}}{0.549 \text{ s}} = 11.4 \text{ rad s}^{-1}$ $v_{max} = 11.4 \text{ rad s}^{-1} \times 3.0 \times 10^{-2} \text{ m} = 0.343 \text{ m s}^{-1}$	**6**