## F7 Oscillators

F7.1 A mass on a spring oscillates 5 times in 4.2 s.

    a) Calculate the angular frequency.

    b) Calculate the spring constant if the mass is 300 g.

F7.2 Calculate the maximum speed of an oscillator if its amplitude is 3.0 cm and its time period is 0.65 s.

F7.3 Calculate the maximum acceleration of an oscillator if its maximum speed is 1.2 m s$^{-1}$ and its amplitude is 6.0 cm.

F7.4 A mass of 2.0 kg is suspended from a spring with constant 24 N m$^{-1}$. Calculate the time period of the oscillation.

F7.5 The height of the water on a beach can be approximated as simple harmonic motion with a period of 12 hours. If the mean water height is 3.5 m, the amplitude of the tide is 1.6 m, and 'high water' occurs at 7am one day, what would you predict the height of the water to be at 11am?

F7.6 A man jumps off a bridge attached to a bungee. The time period of the oscillation is 4.7 s, and its amplitude is 6.2 m.

    a) Calculate his maximum speed as he goes up and down.

    b) The man has a mass of 85 kg. Calculate the maximum resultant force acting on him during the motion.

    c) Calculate the 'spring constant' of the bungee rope using the information given.

F7.7 Dr Nasty hates laundry. He designs 40 kg washing machines which resonate when they spin the clothes. His machine spins at 1200 rpm, and when it resonates, it lurches about in the kitchen, putting holes in the cupboards and making a lot of noise. Calculate the 'spring constant' he designs the machines to have in order to achieve his horrible plan.