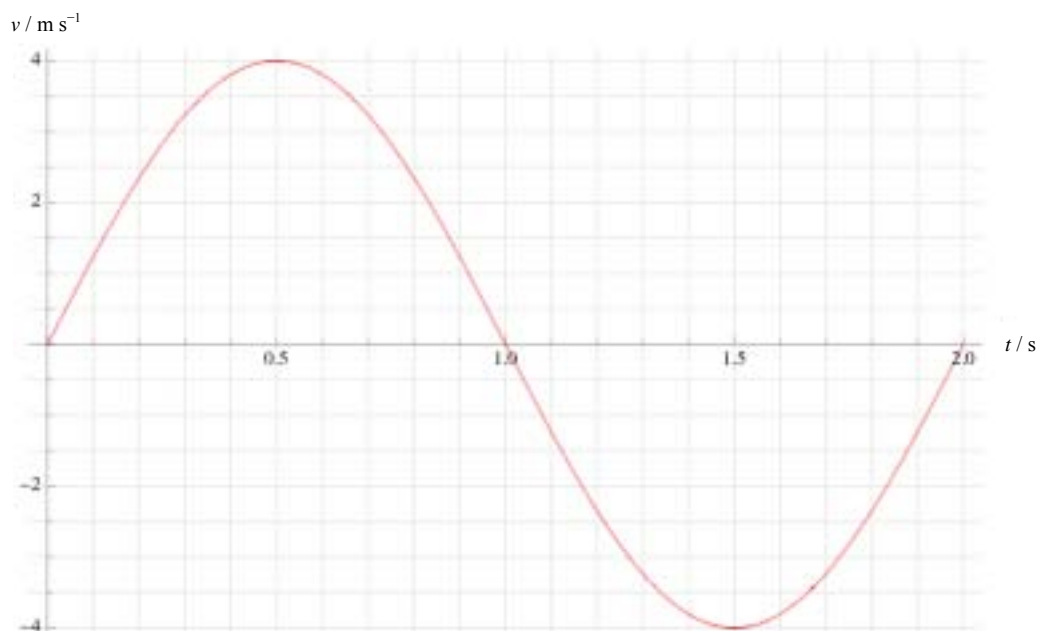
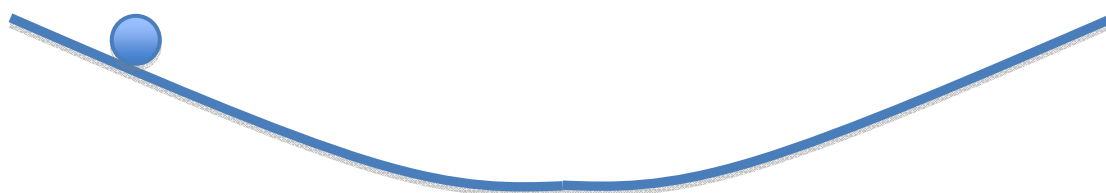


Extension Worksheet – Topic 4, Worksheet 1

- 1 The graph shows the variation with time of the velocity of a particle executing simple harmonic motion.

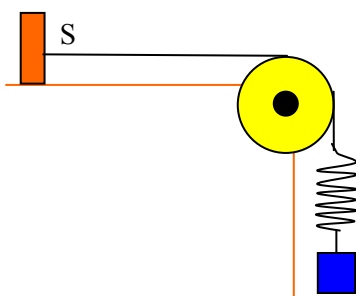


- a Calculate the amplitude of oscillations. [2]
- b **Hence**, state the area under the curve from $t = 0$ to $t = 1.0$ s. [1]
- c Draw a sketch graph to show the variation with time of the acceleration of the particle. [2]
- 2 A ball is released from the position shown inside a bowl whose sides are essentially straight.

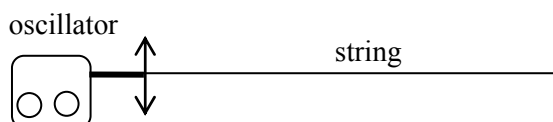


- a State why the motion of the ball will be oscillatory. [1]
- b Determine whether the oscillations will be simple harmonic. [2]

- 3** A string attached to a support S goes over a pulley and is attached to a spring of spring constant 240 N m^{-1} . The spring is attached to a mass of 1.2 kg that hangs vertically as shown. Damping is very light. The tension T in a spring of spring constant k is given by $T = kx$ where x is the extension of the spring.



- a** State what is meant by **damping**. [1]
- b** Calculate the extension of the spring when the mass hangs stationary at the end of the spring. [2]
- c** The mass is pulled below its equilibrium hanging position in **b** by a small distance and is then released. Calculate the frequency of oscillations of the mass. (The period is given by $T = 2\pi\sqrt{\frac{m}{k}}$.) [2]
- d** The distance the mass is pulled down in **c** is 5.1 cm . Calculate the net force on the mass when the mass is at its lowest point. [2]
- e** Calculate the maximum acceleration of the mass. [2]
- f** Determine the maximum speed of the mass during its oscillations. [1]
- g** The support S is now made to oscillate horizontally with frequency of 2.25 Hz . Discuss the effect this will have on the amplitude of oscillations of the hanging mass. [2]
- 4** An oscillator is attached to the free end of a string that is kept tight.



- A transverse wave is established on the string when the oscillator is turned on. The frequency of the oscillator is now doubled. State and explain the change (if any) on the wavelength of the wave on the string. [2]