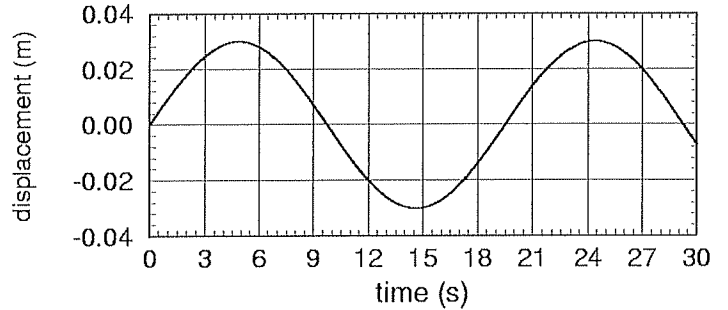
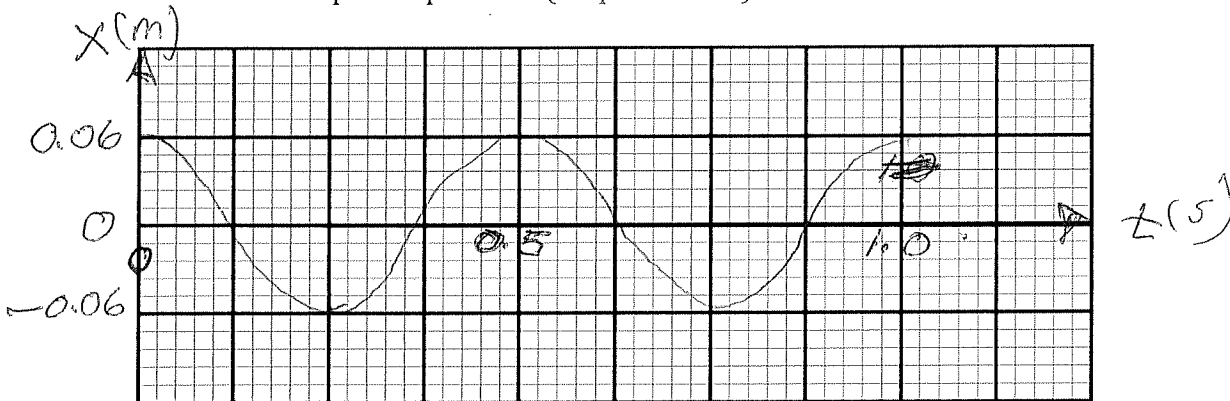


1. A mass $M=0.25$ kg oscillates without friction as shown in the graph.

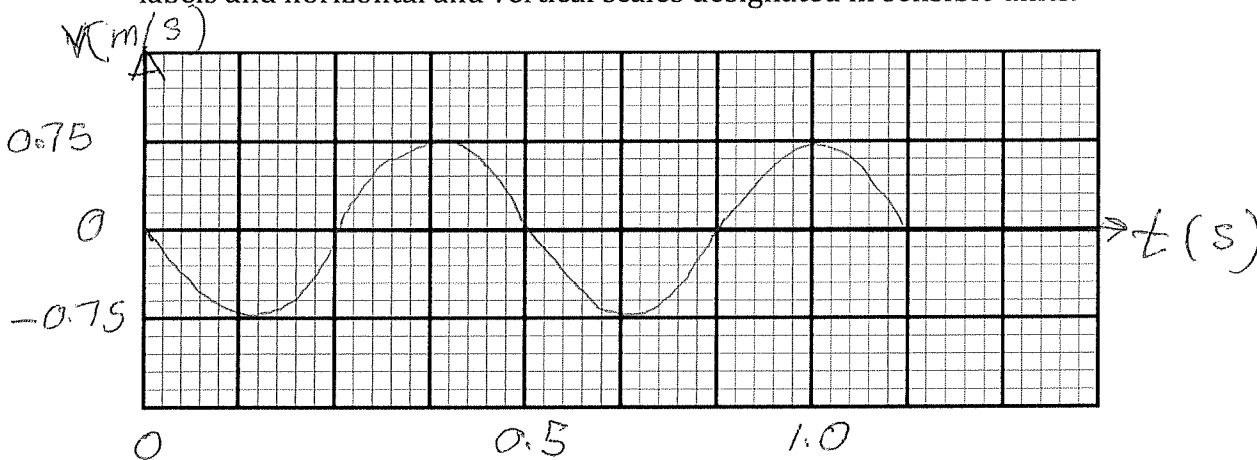
- What is the amplitude of oscillation? $A = 0.03$ m
- What is the angular frequency ω of oscillation? $\omega = 2\pi/T = 0.32$ s⁻¹
- What is the phase ϕ of this oscillator using the convention $x=A\cos(\omega t+\phi)$, where x is the displacement? $\phi=-\pi/2$
- What is the maximum velocity of the mass? $v_{\max} = A\omega = 0.0097$ m/s
- What is the velocity at time $t=11$ s?
 $v = -A\sin(\omega t+\phi) = -0.03\sin(2.23 \text{ rad}) = -0.024$ m/s
- How much energy does the oscillator have? $\frac{1}{2}Mv_{\max}^2 = 1.17 \times 10^{-5}$ J



2a. An oscillator has frequency $f = 2.00$ Hz, and maximum displacement $x(t=0) = 0.06$ m at time $t = 0$. Graph the position (displacement) versus time for a time interval of 1.00 s.



2b. For the same oscillator, graph the velocity versus time. All graphs need to have axis labels and horizontal and vertical scales designated in sensible units.



$$v_{\max} = \omega A = 2\pi f A = 2\pi (2 \text{ s}^{-1})(.06 \text{ m}) = 0.75 \text{ m/s}$$