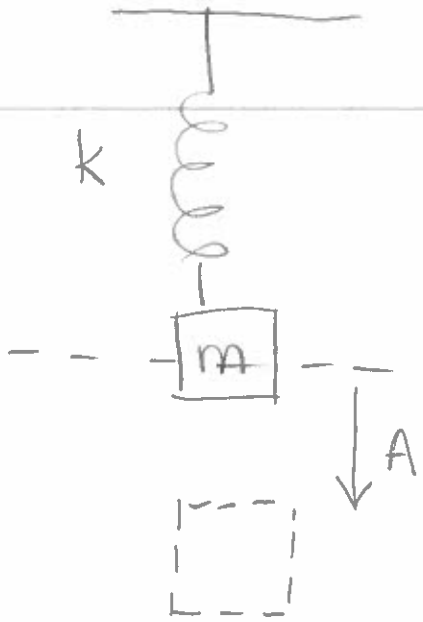

mass $m = 0.58$ kg

spring k = unknown N/m

Fred pulls the weight a distance A away from equilibrium, then releases it. Video measurements reveal that as it moves up and down

period $P = 1.092$ s

max speed $V_{max} = 1.093$ m/s

From which

$$P = \frac{2\pi}{\omega} = \frac{2\pi}{\sqrt{k/m}} \rightarrow \frac{k}{m} = \frac{4\pi^2}{P^2}$$

$$\rightarrow \boxed{k = \frac{4\pi^2 m}{P^2} =} \; 19.20 \; \frac{N}{M} \quad \text{in this example}$$

The total energy is equal to $\frac{1}{2} m V_{max}^2$, so

$$\boxed{\frac{1}{2} m V_{max}^2 = E_{tot}} = 0.346 \text{ J}$$

but when all kinetic turns into spring potential energy

$$E_{tot} = SPE_{max} = \frac{1}{2} k A^2$$

$$\rightarrow \boxed{A = \sqrt{\frac{2 E_{tot}}{k}}} = 0.19 \text{ m}$$