

Solutions

2.1 A Velocity is greatest near equilibrium for ideal SHM, while acceleration magnitude is greatest at extreme displacement. Resonance can occur near the natural frequency under periodic driving, with amplitude limited by damping.

2.2 $T = \text{total time} / \text{cycles} = 45 / 30 = 1.5 \text{ s}$.

2.3 False. Not every repeated motion is SHM. A force proportional to displacement but directed away from equilibrium does not produce SHM.

2.4 resonance. resonance means A large response to periodic forcing near a natural frequency.

3.1 $T = 1.60 \pm 0.02 \text{ s}$, relative uncertainty 1.25%. A single cycle with the same $\pm 0.4 \text{ s}$ timing uncertainty has much larger relative uncertainty. Define the cycle consistently.