

42.3: Frequency and Period

The angular frequency ω described earlier is a measure of how fast the oscillator oscillates; specifically, it measures how many radians of its motion the oscillator moves through each second, where one complete cycle of motion is 2π radians. A related quantity is the frequency f , which describes how many complete cycles of motion the oscillator moves through per second. The two frequencies are related by

$$\omega = 2\pi f. \quad (42.3.1)$$

You can think of ω and f as really being the same thing, but measured in different units. The angular frequency ω is measured in units of radians per second (rad/s); the frequency f is measured in units of hertz (Hz), where $1 \text{ Hz} = 1/\text{sec}$.

The reciprocal of the frequency is the period T , and is the time required to complete one cycle of the motion:

$$T = \frac{1}{f} = \frac{2\pi}{\omega} \quad (42.3.2)$$

The period is measured in units of seconds. As shown in the plot of $x(t)$ (Fig. 39.1.1), the period T is the time between peaks in the motion.

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