

The sequence of events that forms one unit of a periodic motion is called a cycle. In one cycle, the oscillating object moves to and fro, eventually returning to its original position and direction, whereupon the cycle will begin again. The time it takes for the oscillating system to complete one cycle is called its **time period**.

The **frequency** of an oscillation is defined as the number of cycles it executes per unit time. The SI unit of time is the second, so frequency is usually the **number of cycles per second**.

One cycle per second ( $1 \text{ s}^{-1}$ ) is called one **hertz** (Hz) - this is the SI unit of frequency.

Note that the frequency does not have to be a whole number. For example, if a system goes through one and a half cycles in a second, then its frequency is 1.5 Hz or  $1.5 \text{ s}^{-1}$ .

Questions 1 to 9 show how frequency is linked to time period.

1. If a system has a time period of 0.5 s, how many cycles will it go through per second?  
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2. If a system has a time period of 0.25 s, how many cycles will it go through per second?  
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3. If a system has a time period of 2 s, how many cycles will it go through per second?  
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4. If a system goes through 2 cycles in a second, how long does one cycle take?  
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5. If a system goes through 4 cycles in a second, how long does one cycle take?  
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6. From the pattern of your answers above, if a system has a time period of T (measured in seconds), how many cycles will it complete per second?  
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7. Write a simple equation to find frequency f, from time period, T.  
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8. Write another equation to find T from a given f.  
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9. Mains electricity 'oscillates' with a frequency of 50 Hz. What is the time period for one of its oscillations or cycles ?  
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## Answers

1. 2 cycles each second
2. 4 cycles per second
3. 0.5 cycles per second
4. 1 second
5. 0.25 seconds
6. 1/period
7.  $f = \frac{1}{T}$
8.  $T = \frac{1}{f}$
9. 0.02 s