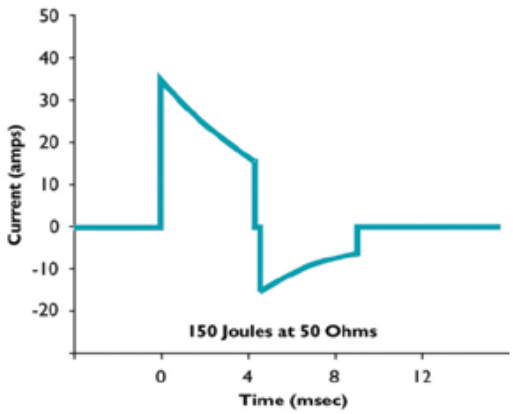
Defibrillators and Your Heart



1. What is being measured on the vertical (*y*) axis?
   Electrical current, measured in amps (amperes). The current available from a typical wall socket is about 15 amps.
2. What is being measured on the horizontal (*x*) axis?
   Time, measured in milliseconds. One millisecond is one-thousandth of a second.
3. What is the duration of this electrical discharge?
   Roughly 9 milliseconds. The blink of an eye lasts about 200 milliseconds.
4. Sometimes the current has a positive value, and sometimes it is negative. What do you suppose this shows about the flow of the electrical current?
   In this defibrillator, the direction of current flow reverses after about 4 milliseconds.
5. In mathematical terms, is this waveform a function? Justify your answer.
   It is a piecewise continuous function in that individual segments may be treated as functions for our purposes.
6. Over what time periods is this waveform linear?
   Before zero seconds, if you even want to count that.
   Perhaps for a very brief interval near 4 milliseconds, as the direction of flow is changing.
   After 9 milliseconds, after the current has stopped.
7. Over what time periods is this waveform exponential?
   The two curved segments are both examples of exponential decay, although students might be confused by the second segment as it is decaying from a negative value toward zero. In other words, electrical flow from capacitors is always exponential. Capacitors are ubiquitous in modern electronics so engineers and technicians need to understand exponential functions.

To learn more about the heart and defibrillators, spend some time exploring THIS website.

Waveforms from: R Dickerson (2011) The old wave, Southern African Journal of Anaesthesia and Analgesia, 17:2, 205-214, DOI: 10.1080/22201173.2011.10872780