

Answer on Question #71712-Physics-Other

A graph of acceleration of the table versus time, termed a ballistocardiogram, is generated. Based on these measurements, the acceleration of the blood ejected by the heart can be determined. Patients with low blood accelerations generally have weakened heart muscles.

A sketch of a single cycle of a ballistocardiogram is given in the figure. (Figure 1). The units of the graph are arbitrary and linear for both time, t , and acceleration, a . At what time (in the arbitrary time units of the graph) is the speed of the table (and hence the speed of the blood in the opposite direction) a maximum?

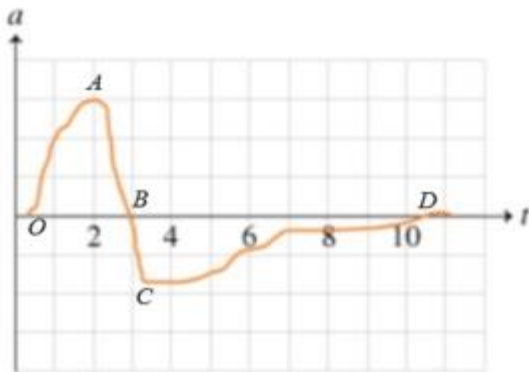


Figure 1: acceleration-time graph

Solution

The speed can have a maximum when acceleration is zero: points B and D.

The second derivative test for a function is,

$$\frac{d^2v}{dt^2} < 0$$

$$\frac{da}{dt} < 0$$

Thus, the slope of the acceleration should be negative. It is point B. So,

$$t = 3.$$

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