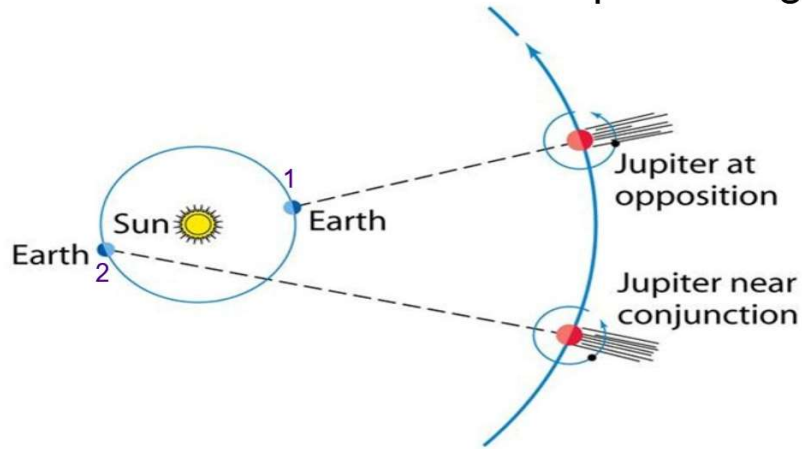


# Answer for Roemer's calculation of c

Wednesday, May 10, 2023 9:50 AM

## Answer

### Roemer's calculation of the speed of light



Roemer knew that Io had a period of 1.80 days as it orbits Jupiter. So, every 43.2 hours, observers on earth will see Io emerge from Jupiter's shadow. After observing this pattern for several years, he noticed that the emergence of Io was late by about 22 minutes when Earth was farther away from Jupiter (point 2) compared to when Earth was closer to Jupiter (point 1). He proposed that light travels at a finite speed; therefore, light coming from Io takes longer to reach point 2 than point 1. At that time, the diameter of earth's orbit was estimated to be  $2.9 \times 10^{11}$  meters. Based on this information, what did Roemer calculate as the speed of light?

$$d = 2.9 \times 10^{11} \text{ m}$$

$$t = 22 \text{ min} \left( \frac{60 \text{ s}}{\text{min}} \right) = 1,320 \text{ s}$$

$$V = \frac{d}{t} = \frac{2.9 \times 10^{11} \text{ m}}{1,320 \text{ s}} \rightarrow V = 2.2 \times 10^8 \text{ m/s}$$

We now know  $c = 3.00 \times 10^8 \text{ m/s}$