Some Clicker Questions - #1

\[ \Delta x \Delta p \geq \frac{h}{4\pi} \]

What is the meaning of Heisenberg’s Uncertainty Principle
A) Space and time are combined into a 4 dimensional space-time
B) Small objects have a wave function
C) **It is not possible to know the exact position and momentum of an object at the same time**
D) It is not possible to ever know the exact position of an object
E) It is not possible to ever know the exact momentum of an object
Some Clicker Questions - #2

\[
\Delta x \Delta p \geq \frac{\hbar}{4\pi}
\]

For this problem assume that \(h=1\). \(\pi = 3.1415\)

Suppose that the position is known to \((1/4\pi)\) m.

\[\Delta x = (1/4\pi) \text{ m}\]

What is the minimum uncertainty in velocity for a 1 kg particle? Recall: momentum = mass \times velocity

A) 1 m/s  B) 3 m/s  C) 4.5 m/s  D) 7 m/s  E) 9 m/s
In the previous problem, the uncertainty in velocity was 1 m/s. In 1000 s (16.7 min), what is the uncertainty in position resulting from this uncertainty in velocity? Recall: distance = velocity x time, and
Uncertainty in distance = (uncertainty in velocity) x time

A) 1 km  B) $\pi$ km  C) 5 km  D) 100 m  E) 10 m

On the homework you will have to use the real value for $h$ and real masses, etc.