SP2

The Good, the Bad and the Ugly of Quantum Mechanics

Consider a particle of mass m in the following state of the "particle in a box" problem [$V(x) = 0$ for $0 < x < a$ and $V(x) = \infty$ otherwise]:

$$\psi(x) = \sqrt{\frac{2}{a}} \sin\left(\frac{3\pi x}{a}\right) e^{i\pi/3}$$

For each question that follows, decide if it is a question that *can* be answered (within our present understanding of Quantum Mechanics) or not by labeling each question as good or bad. Good questions can be answered "yes" or "no", bad questions are incorrectly phrased and cannot be answered "yes" or "no". If the question is bad explain why, if it is good then answer it.

(a) Does the particle spend half of its time in the left half of the box?

(b) If I measure the particle's energy can I predict what I'll get?

(c) Is Quantum Mechanics really soooo bizarre?

(d) Does this particle have zero momentum?

(e) Since the particle is in a stationary state shouldn't I always get the same answer when I measure its position?