

Question 1

A particle with definite momentum $p > 0$ is described by

$$\Psi(x, t) = Ae^{i(px/\hbar - \omega t)}.$$

Which of the following is true of the outcomes of a measurement of the particle's position at $t = 0$?

1. The most likely outcome is $x = 0$.
2. The most likely outcome is $x = 0, \pm 2\pi, \pm 4\pi, \dots$
3. The most likely outcome is $x = 0, \pm \frac{2\pi\hbar}{p}, \pm \frac{4\pi\hbar}{p}, \dots$
4. All outcomes are equally likely.

Question 2

A particle with definite momentum $p > 0$ is described by

$$\Psi(x, t) = Ae^{i(px/\hbar - \omega t)}.$$

Which of the following is true at any time?

1. The particle is equally likely to be found anywhere regardless of the time at which it is observed.
2. The particle is equally likely to be found further right at later times.
3. The particle is equally likely to be found further left at later times.

Question 3

At one particular instant the wavefunction for a particle is

$$\psi(x) = Ae^{-(x-x_0)^2/4a^2}$$

where $A > 0$ and $a > 0$.

Which of the following is true?

1. This describes a particle which will definitely be located at x_0 .
2. This describes a particle which is equally likely to be located at any x .
3. This describes a particle which will definitely be found in a limited range around x_0 .
4. This describes a particle which will typically be found somewhere near x_0 .