

A **qubit state** refers to the quantum condition of a qubit at any given moment. Unlike classical bits, which can only be in a definite state of **0 or 1**, a qubit can exist in a **superposition** of both states simultaneously.

### Key Properties of a Qubit State

1. **Superposition** – A qubit exists in both states  $|0\rangle$  and  $|1\rangle$  at the same time until it is measured.
2. **Collapse Upon Measurement** – When measured, a qubit "collapses" into either  $|0\rangle$  or  $|1\rangle$ , based on probability.
3. **Bloch Sphere Representation** – A qubit's state can be visualized as a point on a sphere, where:
  - The north pole represents  $|0\rangle$ .
  - The south pole represents  $|1\rangle$ .
  - Any point on the sphere represents a combination (superposition) of these states.