

HSSP Philosophy of Quantum Mechanics

07/10/11

Activity: Stern-Gerlach Experiment

Activity: Your lab group of experimental physicists is investigating the properties of a particle. Each group is learning something different, and you will be sharing your findings with the other groups.

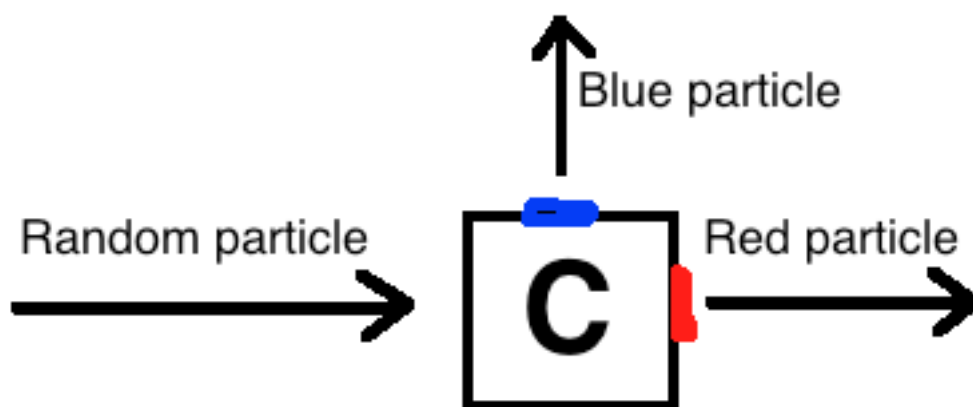
What you know: You have all observed that these particles have many properties, such as mass, charge, etc. You know what properties a particle has by **doing an experiment** on it. (Think about it; how else would you learn anything about the particle?) Today, you are doing experiments about two of the properties, color and hardness. A particle's color can be red or blue, and its hardness can be hard or soft,

Color: Red (R) or Blue (B)

Hardness: Hard (H) or Soft (S)

Lab materials: You have a stream of random particles. You have Experiment Boxes. It doesn't matter what's inside the boxes, it just matters that Color boxes test the color of a particle that goes through it, and Hardness boxes test the hardness. Depending on the result of the test, the particle comes out the side or the top of the box.

For example, a color experiment looks like this:



Think about this: When I say “the particle is blue,” what do I mean? I mean something about what side of a color box it comes out of. One of the lab groups will explore this question further.

Lab group investigations:

1. Are color and hardness **persistent**? For example, does a particle's color change mid-flight, or inside the box?
2. Are color and hardness **independent**? For example, are red particles more often hard and blue particles more often soft?
3. What happens when you line up two different boxes?
4. Could you build a combined color/hardness box to measure both properties at the same time?

All groups should be prepared to share their findings with other groups.