

Uncertainty Principle -Implications

The uncertainty principle explains why electrons in atoms don't simply fall into the nucleus: If the electron were confined too close to the nucleus (small Δx), it would have a large Δp , and therefore a very large average kinetic energy ($\approx (\Delta p)^2/2m$).

The uncertainty principle does not say "everything is uncertain". Rather, it tells us what the limits of uncertainty are when we make measurements of quantum systems.

Some classical features, such as paths, do not exist precisely, because having a definite path requires both a definite position and momentum. One consequence, then, is that electron orbits do not exist. The atom is not a miniature solar system.

Other features can exist precisely. For example, in some circumstances we can measure an electron's energy as accurately as technology allows.

Serious philosophical issues remain open to vigorous debate, e.g., whether all outcomes or only one outcome actually occur.