

Problems discussed in the videos:

Videos (8) – (9)

An iron atom and a hydrogen atom have the same kinetic energy E and are moving at speeds much less than the speed of light.

(a) How is the de Broglie wavelength λ related to the magnitude p of the momentum?

Explain

(b) How is the magnitude of the momentum related to the kinetic energy of a particle of mass m that is moving at a speed that is much less than the speed of light? Explain.

(c) Which atom has the greater de Broglie wavelength? What is the ratio between the wavelengths of the iron and hydrogen atoms? Explain.

(d) The atoms are passed through a small slit. Which type will make a larger (more spread out) diffraction pattern?

Video (13)

An electron in hydrogen absorbs a photon and jumps to a higher orbit.

(a) Find the energy the photon must have if the initial state is $n=3$ and the final state is $n=5$.

(b) If the initial state was $n=5$ and the final state was $n=7$, would the energy of the photon be greater than, less than, or the same as that found in part (a)? Provide your answer in conceptual terms only and explain your reasoning.