

The Electron

Unit: Electronic Structure

NGSS Standards/MA Curriculum Frameworks (2016): HS-PS1-1

Mastery Objective(s): (Students will be able to...)

- Describe & explain the particle vs. wave nature of electrons.

Success Criteria:

- Descriptions successfully communicate accurate information about electrons and their behavior.

Tier 2 Vocabulary: charge

Language Objectives:

- Explain scientific information about electrons.

Notes:

electron: a small subatomic particle found outside the nucleus of an atom.

mass = 9.11×10^{-31} kg = 9.11×10^{-28} g
= $\frac{1}{1836}$ of the mass of a proton

charge = -1.6022×10^{-19} coulomb
= -1 elementary charge

radius = 2.8179×10^{-15} m

electric current (electricity): electrons moving from one place to another.

Protons and neutrons remain in the nucleus of their atom (except for nuclear decay), but electrons can be removed from one atom and added to another.

ion: an atom (or group of atoms that functions like a single atom) that has an electric charge because it has either gained or lost electrons.

Because an electron has mass (though it's very small—about $\frac{1}{1836}$ of the mass of a proton or neutron), this means electrons are particles, and all of the equations that apply to motion of solid particles also apply to electrons.

However, an electromagnetic wave is a wave of electricity, and electricity is made of electrons that are moving. This means that moving electrons are also waves—they move through empty space, carrying energy with them. Therefore, all of the equations that apply to waves also apply to electrons.

This means that an electron must be both a wave and a particle at the same time.

Use this space for summary and/or additional notes: