Philosophers invented concept of an atom, smallest particle of matter, stuff
in ~400 BC: earth, wind, fire, water

1808: Dalton

1. elements made of tiny atoms
2. atoms are indivisible
3. elements’ atoms exactly the same
4. different elements = different atoms
5. atoms combine into compounds w/ small, whole # ratios

Chemistry is rearranging atoms into different compounds

Before Dalton:
- chemists had elements
- found percent composition: one white, dry powder was 39% copper, 32% sulfur, 39% oxygen
- chemists memorized these percentages for everything they knew

Small, Whole-Number Ratios
- 1st reaction: No way!
- 2nd: wow, it works! \( \Rightarrow \) Law of Multiple Proportions

After Dalton:
- don’t memorize %, do ratios
- learn many

\( \text{CaSO}_4 \) breath out
\( \text{CO}_2, \text{CO} \) don’t
R-barbecue inside
19th Century (1800s, 1900s)
- started to find things smaller than atoms

1820 Faraday finds electron tiny, light, negative charge, 1/10000 smaller than hydrogen
1919 Rutherford proton heavier, +1 charge ≈ hydrogen
1932 Chadwick neutron heavier (≈ hydrogen), neutral charge

• Atoms are made up of these smaller particles (lose Dalton's #2)

  How are they put together?

  atom (spherical) pudding
  ↑ atom (spherical) pudding
  electrons

  → sounds good? yummy?

  Group Exercise (5-10 minutes)

  1911 Rutherford starts experiments with particles.
  → an alpha particle +2 charge, mass 4 hydrogen,
  → shoots a beam of them at gold target,
  → is made up of 2 protons & 2 electrons

  Why gold? known how to make it thin

  → expectations? (DOTS, plum pudding)
Rutherford's slaves (graduate students) came back with these results:

He said: "Don't again, otherwise mistakes or you don't get any pudding!"

Students tried over & over & kept getting the same thing. Eventually determined that there was no plum pudding.

New Picture (model) of the atom:
- Mostly empty space
- Center of atom (nucleus) has protons & neutrons (overall heavy & charge)
- Electrons are in rest of the space, thinly populated (cloud) & charge exactly balance

Later revised to a planetary model:
- Electrons orbit the nucleus