

**Interactive Classroom**

**Glencoe Science**

# CHEMISTRY

MATTER AND CHANGE

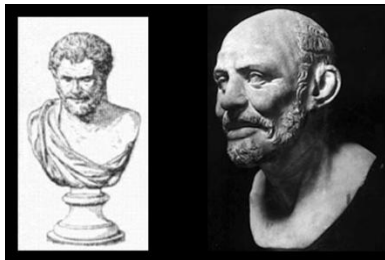
## Chapter 4

The Structure of the Atom

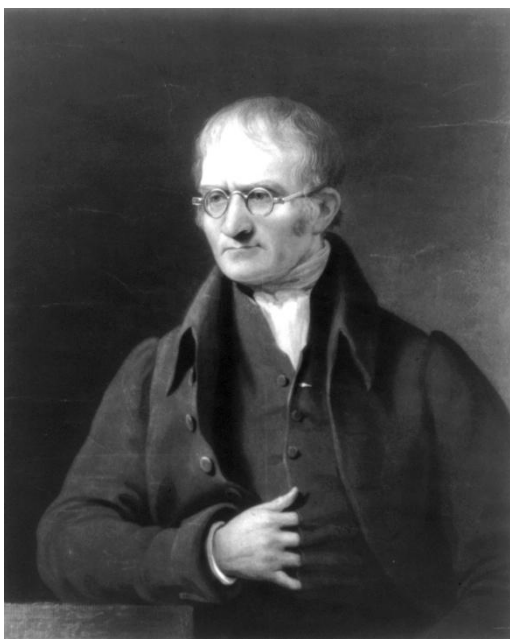
**Mc  
Graw  
Hill** **Glencoe**

Click the mouse button or press the Space Bar to continue.

## 4.1/4.2 Review

**Democritus**

Greek philosopher that  
1<sup>st</sup> theorized the  
existence of the atom

**John Dalton**

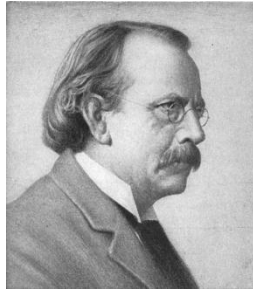
Began modern chemistry  
movement (atomic theory)

Postulates of Theory:

1. Matter is composed of atoms
2. Atoms are indivisible and indestructible
3. Atoms of each element have specific properties
4. Different atoms have different properties
5. Different atoms can form compounds of specific proportions
6. In chem. rxns, atoms are separated, combined, or rearranged



## J.J. Thompson



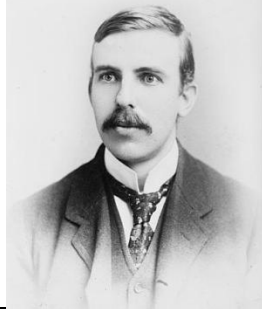
Identified the electron and determined its charge (-).

## Niels Bohr



Theorized the arrangement and behavior of electrons in the atom.

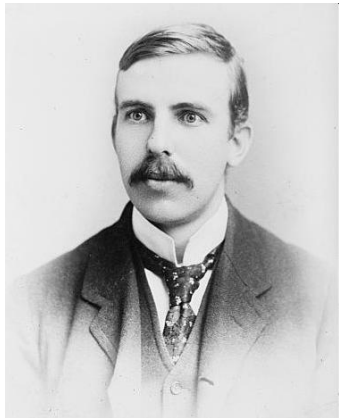
## Ernest Rutherford



Determines that an atom is mostly empty space with a tiny positively charged nucleus



## Rutherford/Goldstein



Determined the existence and charge of the proton (+)

## James Chadwick



Proved the existence of neutrons in the atom.



## Section 4.3 How Atoms Differ

### Objectives

- **Explain** the role of atomic number in determining the identity of an atom.
- **Define** an isotope.
- **Explain** why atomic masses are not whole numbers.
- **Calculate** the number of electrons, protons, and neutrons in an atom given its mass number and atomic number.



## Section 4.3 How Atoms Differ (cont.)

### Review Vocabulary

**periodic table:** a chart that organizes all known elements into a grid of horizontal rows (periods) and vertical columns (groups or families) arranged by increasing atomic number

### New Vocabulary

atomic number

atomic mass unit (amu)

isotopes

atomic mass

mass number



The number of protons and the mass number define the type of atom.



## Atomic Number

- Each element contains a unique positive charge in their nucleus.
- The number of protons in the nucleus of an atom identifies the element and is known as the element's atomic number.

Hydrogen	Chemical name
1	Atomic number
<b>H</b>	Chemical symbol
1.008	Average atomic mass



## Isotopes and Mass Number

- All atoms of a particular element have the same number of protons and electrons but the number of neutrons in the nucleus can differ.
- Atoms with the same number of protons but different numbers of neutrons are called isotopes.



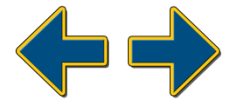
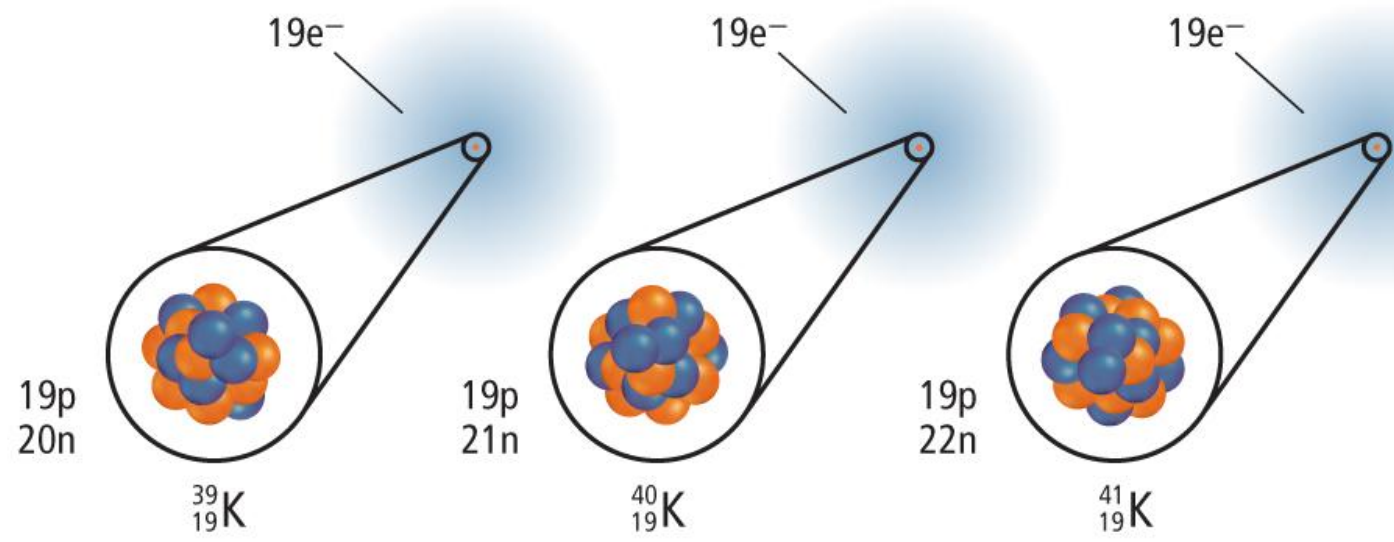
## Isotopes and Mass Number (cont.)

- The relative abundance of each isotope is usually constant.
- Isotopes containing more neutrons have a greater mass.
- Isotopes have the same chemical behavior.
- The mass number is the sum of the protons and neutrons in the nucleus.



# Isotopes and Mass Number (cont.)

	Potassium-39	Potassium-40	Potassium-41
Protons	19	19	19
Neutrons	20	21	22
Electrons	19	19	19



## Mass of Atoms

- One **atomic mass unit** (amu) is defined as  $1/12^{\text{th}}$  the mass of a carbon-12 atom.
- One amu is nearly, but not exactly, equal to one proton and one neutron.

**Table 4.4****Masses of Subatomic Particles**

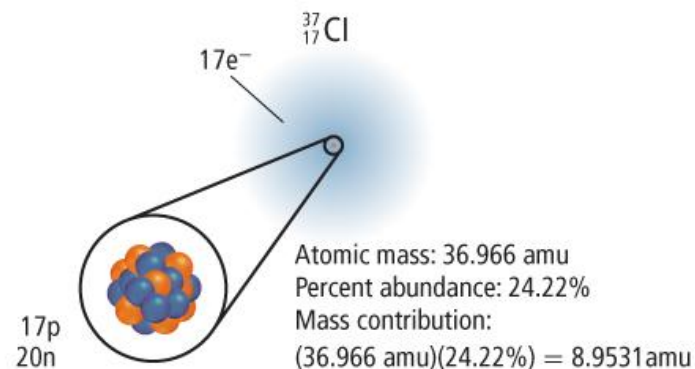
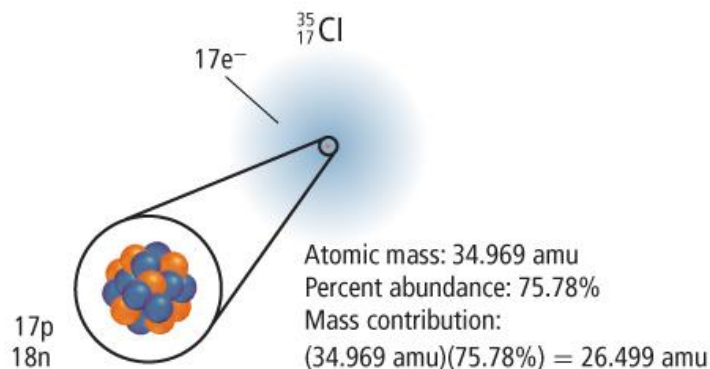
Particle	Mass (amu)
Electron	0.000549
Proton	1.007276
Neutron	1.008665



## Mass of Atoms (cont.)

- The **atomic mass** of an element is the weighted average mass of the isotopes of that element.

Calculate the Weighted Average Atomic Mass of Chlorine



$$\text{Weighted average atomic mass of chlorine} = (26.496 \text{ amu} + 8.957 \text{ amu}) = 35.453 \text{ amu}$$



## Section 4.3 Assessment



An unknown element has 19 protons, 19 electrons, and 3 isotopes with 20, 21 and 22 neutrons. What is the element's atomic number?

A. 38

B. 40

**C. 19**

D. unable to determine



## Section 4.3 Assessment



Elements with the same number of protons and differing numbers of neutrons are known as what?

- A.** isotopes
- B.** radioactive
- C.** abundant
- D.** ions

