

9/4/25

# Key

## Ch. 2 Atoms, Molecules, & Ions

Define the Law of Conservation of Mass?

Matter can't be created or destroyed in a closed system, can only change forms.

List the Postulates of Dalton's Atomic Theory. Recognize which ones have been disproven.

1. Each element is composed of extremely small particles called atoms. (still true)
2. All atoms of a given element are identical in size, mass, and other properties (Disproven)
  - ↳ isotopes show that atoms of same element can have different masses.
3. Atoms cannot be subdivided, created, or destroyed. (Disproven)
  - ↳ atoms made up of subatomic particles (protons, neutrons, electrons) and in nuclear reactions atoms can be transformed or destroyed.
4. Atoms of different elements combine in simple whole-number ratios to form chemical compounds.

What did the cathode-ray experiment discover?

J.J. Thomson (1897) discovered the electron.

-observed the rays were deflected by electric and magnetic fields including they carried a negative charge.

What experiment discovered the nucleus?

Ernest Rutherford (1909) through gold-foil experiment aka alpha scattering experiment.

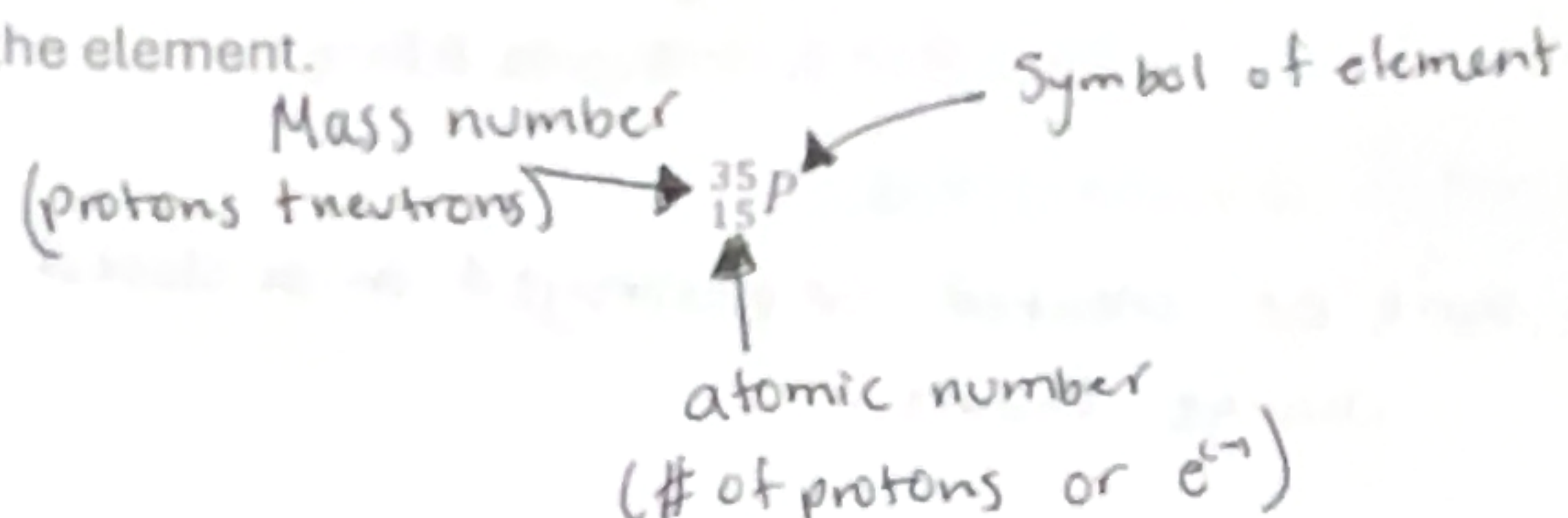
- discovered atom has small, dense, positively charged center (nucleus)
- fundamentally changed the model of the atom and laid groundwork for nuclear model

Compare the subatomic particles of an atom.

| Particle | Charge       | Location            |
|----------|--------------|---------------------|
| Proton   | (+) positive | Nucleus             |
| Neutron  | (0) Neutral  | Nucleus             |
| Electron | (-) Negative | Surrounding nucleus |



Label all parts of the element.



What is an isotope?

atoms of the same element with different masses.  
(different # of neutrons but same # of protons)

Chlorine has two common isotopes. Find the number of protons, neutrons, and electrons.

| Symbol           | Protons | Neutrons       | Electrons |
|------------------|---------|----------------|-----------|
| $^{35}\text{Cl}$ | 17      | $35 - 17 = 18$ | 17        |
| $^{37}\text{Cl}$ | 17      | $37 - 17 = 20$ | 17        |

What is an ion? What is a cation? What is an anion?

ion - atom or molecule that's gained or lost one or more  $e^-$  giving it a net electric charge.

cation - positively charged ion that's lost an  $e^-$  Ex:  $\text{Na} \rightarrow \text{Na}^+$

Anion - negatively charged ion that's gained an  $e^-$  Ex:  $\text{Cl} + e^- \rightarrow \text{Cl}^-$

An element X has two naturally occurring isotopes:

- Isotope X-50 with an atomic mass of 49.95 amu and an abundance of 75%
- Isotope X-52 with an atomic mass of 51.94 amu and an abundance of 25%

Calculate the average atomic weight of element X.

- 1st - convert percentage to decimals
- 2nd - plug into formula
- 3rd - keep Sig Figs in mind

$$\begin{aligned} \Sigma &= \left[ (\text{isotope mass}) \times (\text{fractional natural abundance}) \right] \\ &= (49.95 \times 0.75) + (51.94 \times 0.25) \\ &= (37.4625 + 12.985) \\ &= 50.4475 \rightarrow \boxed{50.45 \text{ amu}} \end{aligned}$$



The rows on the periodic table are called Periods?

The columns on the periodic table are called Groups?

Elements in the same group have similar Chemical properties.

List all the diatomic elements:

Hydrogen ( $H_2$ )

Bromine ( $Br_2$ )

Nitrogen ( $N_2$ )

Iodine ( $I_2$ )

Oxygen ( $O_2$ )

Fluorine ( $F_2$ )

Chlorine ( $Cl_2$ )

\* they essentially form the #7 on the periodic table

What type of formula gives the exact number of atoms of each element in a compound?

Molecular formulas

\* If we knew the molecular formula we can determine the empirical formula.

What type of formula gives the lowest whole-number ratio of atoms of each element in a compound?

Empirical formulas

What type of bonding occurs between a metal and a non-metal?

Ionic bonding

\* electrons shared \*

What type of bonding occurs between a metal and polyatomic ion?

Ionic bonding

\* electrons shared \*

What type of bonding occurs between two non-metals?

Covalent bonding

\* electrons transferred \*