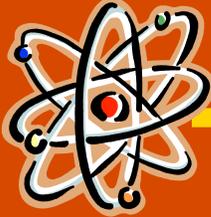


The Atom!!!



Lect 2: Atomic Basics,
Atomic Math
Chapter 12, Section 2

Warning: Danger lies ahead

- I think this is the first real section where things start to get confusing.
- There is A LOT of new vocabulary, all of which sounds sort of the same.
- It is important that you
(1) pay attention,
(2) ask questions and
(3) study this material afterwards.

CAUTION

In The beginning...

- Matter has mass and takes up space.
- Atoms are **basic building blocks** of matter, and cannot be chemically broken down by ordinary means.
- The word atom is derived from the Greek word *atomos*, which means **indivisible** or uncuttable.
- The Greeks concluded that matter could be broken down into particles too small to be seen.
- These particles were called **atoms**.

What is an atom?

- [Brainpop](#)

Atom
Quiz
How did
you do??

Brain POP ATOMS October 31, 2012
elaine

SCORE: 10/10

1. **What is the significance of the periodic table of elements?**
A. It lists all the different metals known to humans.
B. It predicts and lists all the chemical elements in the universe.
C. It explains where different atoms can be found.
D. It predicts that atoms are the building blocks of matter.

2. **What do electrons in the same shell have in common?**
A. They have the same amount of energy.
B. They are all positively charged.
C. They are all inside the atom.
D. They all have neutral charges.

3. **Which of the following is an example of a subatomic particle?**
A. Carbon
B. Oxygen
C. Chlorine
D. Neutronium

4. **What might happen if the strong force didn't exist?**
A. Electrons would have positive charges.
B. Atomic nuclei would fly apart.
C. It would be more difficult to split atoms.
D. Neutrons would not exist.

5. **What two types of particles exist within an atom's nucleus?**
A. Protons and neutrons.
B. Neutrons and electrons.
C. Protons and neutrons.
D. Protons and neutrons.

6. **Which has the greatest number of protons?**
A. An atom of oxygen weighs 8 grams.
B. An atom of oxygen has 8 protons and 8 electrons.
C. An atom of oxygen has 8 protons.
D. An atom of oxygen has 8 protons.

7. **The word "atom" comes from a Greek word for "indivisible." What does this mean?**
A. They cannot be separated once they're bonded with other atoms.
B. They cannot be broken apart without losing their chemical properties.
C. They cannot form bonds with other atoms.
D. They cannot gain or lose electrons.

8. **How are molecules different from atoms?**
A. They consist of several atoms bonded together.
B. They do not contain neutrons.
C. They are neutral atoms.
D. They particles do not have electrical charges.

9. **What can you conclude from the fact that electrons orbit far from their nuclei?**
A. Electrons are extremely small.
B. Atoms are completely mostly of empty space.
C. Nuclei have a positive charge.
D. Atoms consist of negatively charged particles.

10. **With hydrogen atoms, what does the number 1 represent?**
A. An atomic number.
B. A number of electrons.
C. An atomic mass.
D. An atomic number.

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How small is an atom?

- Really really really small!
- The average atom has a diameter of 0.00000003 cm
- It would take 50,000 stacked aluminum atoms to equal the thickness of a sheet of aluminum foil.
- Or, there are over 6,000,000,000,000,000,000,000 (6 x 10²¹) atoms in one drop of water.
 - It would take you about 100 trillion years to count this number out.

Really small!

- If we stretched a penny until it covered the entire United States, each of its atoms would be only 3 centimeters across!



Video Notes

- Take out a piece of notebook paper and at the top of the page write Video Notes.
- The first video you will watch is 5a: How small is an Atom (label this)
- Take 3 bullet points

5a. How small is an atom??

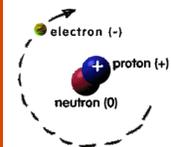


What's an atom made of?

- Even though an atom is really small, it is made of even smaller particles.
- It's basically made of 3 tiny subatomic particles:
 - Protons
 - Neutrons
 - Electrons

An Atom's Parts

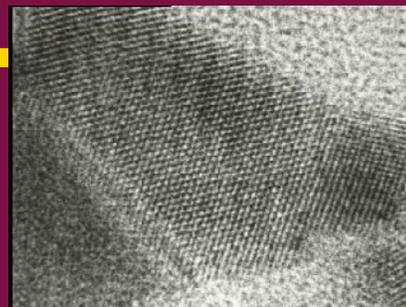
IT'S LIKE THIS...



- The center of an atom is called the **nucleus**.
- The nucleus contains 2 types of particles:
 - **Protons** = positive (+) charge
 - **Neutrons** = no charge, neutral
- This means the nucleus is always positive.

5. Structure of an Atom

Label this on your video notes page and take 3 bullet points



Awful Science Humor

A **neutron** walks into a diner and orders a glass of orange juice at the counter. When the waiter brings the juice, the neutron asks, "How much do I owe you?"

The waiter replies, "For you, **no charge!**"

These things are teeeeny tiny

- The mass of a proton is really small, so small in fact, that scientists created a whole new unit for it.
- A proton has a mass of **1 atomic mass unit (AMU)**.
- A neutron is actually a little bigger than a proton, but not enough to notice the difference, so we say it also has a mass of **1 AMU**.

The Outside of the Atom

- Around the center of the atom we find an electron cloud. The electrons are:
 - Are **negatively (-) charged** particles that orbit around the nucleus.
 - Electrons are very small, so small that it takes over 1,800 electrons to equal the mass of 1 proton. Therefor we usually consider an electron's mass to be 0.
 - So an electron has a mass of **0 AMU**.

Overall Balance

- To review, an atom is made up of 3 types of particles which are:
 - Protons (+)
 - Neutrons (0)
 - Electrons (-)

Notice that the protons and electrons have opposite charges...what does this mean about the overall balance of an atom?

Nucleus (+ charge) = Electron (- charge)

They're totally equal



- It means that these two parts of the atom balance each other out
- The atom is electrically **neutral**, or has no overall charge.
- As long as there are an equal number of electrons and protons, the charges cancel.
- What is $(-2) + (+2) \rightarrow 0$ (no charge!)

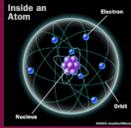
How can I remember all of this?

- **P**rotons = **P**ositive (+)
- **N**eutrons = **N**one, **N**eutral (0)
- **E**lectrons = **N**egative (-).

Summary



	Position	Charge	Mass
Proton	nucleus	+	1 amu
Neutron	nucleus	none	1 amu
Electron	Electron cloud	-	0 amu



6. Atomic Structure

Label this on your video notes page and take 3 bullet points

