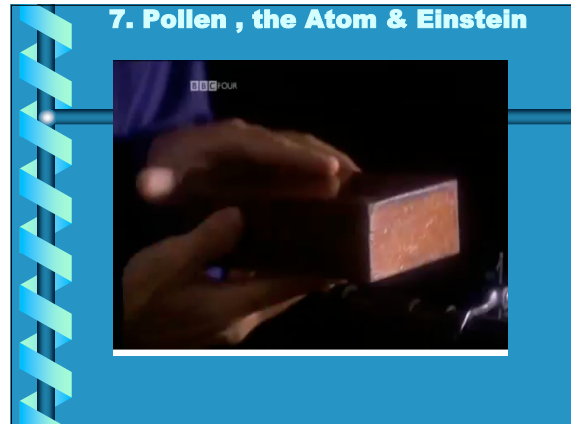


The Atom:

Lect 3: Chp 12 sect 2

STRUCTURE OF THE ATOM



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

- **ATOMS:**
- The smallest piece of an element which still has the properties of that **element** is called an atom.
- Central core is called a **NUCLEUS** , and has a **+** charge.
- It is surrounded by an **Electron Cloud** which has a **-** charge.
- These 2 parts **balance** each other out so that the atom is electrically neutral(or has **NO** electric charge)

- Atoms are composed of three types of particles:
- protons, neutrons, and electrons.
- **Protons and neutrons** are responsible for most of the atomic mass
- (example: in a 150 person 149.99 lbs, are protons and neutrons while only .001 oz. is electrons.)
- (please note scientist have discovered they are actually made up of MORE than 3 parts- which we will talk about later- but for now, I want you to learn the main 3 parts: Protons, neutrons, and electrons)

- In reality the mass of an electron is almost negligible:
- 9.108×10^{-28} grams.
- That's why we basically refer to the mass of an electron as zero amu.

- Both the protons and neutrons are located in the nucleus.
- Protons have a positive (+) charge,
- neutrons have no charge (0) they are neutral.
- Electrons occupy in orbital clouds around the nucleus.
- They have a negative charge (-).

Parts of an atom:

Parts of an Atom

Particle Profile
Name: proton
Charge: positive
Mass: 1 amu
Location: nucleus

- Proton
- in the nucleus
- + (positive) charge
- 1 amu

Parts of an Atom

Particle Profile
Name: neutron
Charge: none
Mass: 1 amu
Location: nucleus

- Neutron
- in the nucleus
- 0 (no) charge
- 1 amu

Parts of an Atom

Particle Profile
Name: electron
Charge: negative
Mass: almost zero
Location: electron clouds

- Electron
- in the electron cloud
- - (negative) charge
- 0 amu

9. Bill Nye: Part 1: The Atom

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

- The number of protons in an atom is called the **atomic number**.
- The elements in the periodic table are arranged according to **increasing atomic number**.
- It is the number of protons that determines the atomic number: H (element hydrogen) = 1.
- The number of protons in an element is constant (H=1, for 1 proton, 2= He helium, for 2 protons... and so on)

- This procedure NEVER changes.
- The protons are the atomic number.
- They identify the element.
- The number of protons is equal to the number of electrons so that the element is electrically stable (or balanced)

- **Mass Number :**
- the number of protons **ADDED** to the neutrons.
- Mass number can vary for the same element, if the element has different numbers of neutrons.
- When this happens, these forms of an element are called **isotopes**.

What's an isotope??

- **Brainpop**

Brainpop
Isotope
Quiz...
How did
You do?

Brain POP ISOTOPES October 31, 2012
elaine

SCORE: 10/10

1. **1** **P** Please list an atom number 4. What can you conclude about an atom of Helium from this?

A. It has four protons.
 B. It weighs four grams.
 C. It has four neutrons and four electrons.
 D. It has a boiling point of 4 degrees Celsius.

2. **1** **0** In what part of an atom are protons to be found?

A. Inside the electrons.
 B. Inside the neutrons.
 C. Inside the atomic nucleus.
 D. Inside the electron shells.

3. **1** **0** How many protons are there in a gram of hydrogen?

A. One atomic mass unit is equivalent to a gram.
 B. One atomic mass unit is much lighter than a gram.
 C. One atomic mass unit is much heavier than a gram.
 D. Atomic mass units and grams measure different properties.

4. **1** **0** The number of electrons in an atom is equal to the number of protons. How many electrons are there in an atom of Helium?

A. Two neutrons.
 B. Two electrons.
 C. Two protons.
 D. Two ions protons.

5. **1** **0** If a carbon atom has 16 protons, 16 electrons, and 16 neutrons, its atomic mass is:

A. 16
 B. 32
 C. 48
 D. 64

6. **1** **0** How many electrons does 1 Carbon, 1 electron, and 1 neutron, have?

A. 1
 B. 2
 C. 3
 D. 4

7. **1** **0** On the periodic table, how is atomic mass represented?

A. As an average of the mass of different isotopes.
 B. As the exact mass of every atom.
 C. As the mass of the most common isotope.
 D. As the masses of all of the protons added together.

8. **1** **0** What do carbon-12 and carbon-14 have in common?

A. They have the same number of protons.
 B. They have the same number of neutrons.
 C. They have the same atomic mass.
 D. They have the same atomic weight.

9. **1** **0** How is carbon-12 different from carbon-14?

A. They have a different number of protons.
 B. They have a different number of electrons.
 C. They have a different number of neutrons.
 D. They are different elements.

10. **1** **0** What are you responsible about carbon-14 from the same?

A. It has 14 electrons.
 B. It has 14 neutrons.
 C. It has 14 protons.
 D. It has an atomic mass of 14.

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- **Chemical properties of isotopes are the same,**
- although the physical properties of some isotopes may be different.
- Some isotopes are radioactive- meaning they "radiate" energy as they decay to a more stable form,
- perhaps another element half-life: time required for half of the atoms of an element to decay into stable form.

- An example of an isotope is oxygen, with atomic number of 8 which can have 8, 9, or 10 neutrons.
- **Carbon 14** is another example. If you take the atomic number 6 and subtract it from the AMU of 14 you find that there are **8 neutrons in the nucleus**.
- This is an isotope of Carbon and is a radioactive isotope known as Carbon-14.
- This radioactive isotope is critical in helping scientists **date plant and animal fossils** and occurs in every 100,000,000 carbon atoms.

ISOTOPES:
Atoms of the same element with different number of neutrons.

- 6 <----- atomic number
- C <----- Element symbol
- Carbon <----- element name
- 12.011 <----- Avg. Atomic mass

Isotope of Carbon would have a **different Atomic Mass** because the number of neutrons is not equal to the number of protons.


Remember:

- number of protons = number of electrons
- The atom is electrically neutral

Electron Clouds:

- The region around the nucleus is called the electron cloud.
- The electrons occupy certain energy levels.
- The farther an energy level from the nucleus, the more energy the electrons will have in it.
- 1st level = 2 electrons
- 2nd level = 8 electrons
- 3rd level = 18 electrons
- Write down 11. Eureka: Electrons on your video notes sheet and take 3 bullet points on the following video.

11. Eureka: The Electron



Quick Review:

- **ATOMIC MASS:** The mass of an atom depends on the number of protons & neutrons it contains
- **AMU** = Atomic mass unit
- **Mass number** is the sum of the protons and neutrons.
- **Neutrons** = mass number - atomic number
- (remember: **Atomic Number** = NUMBER of protons, which = NUMBER of electrons)

12. Bill Nye: The Atom Part 2

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

