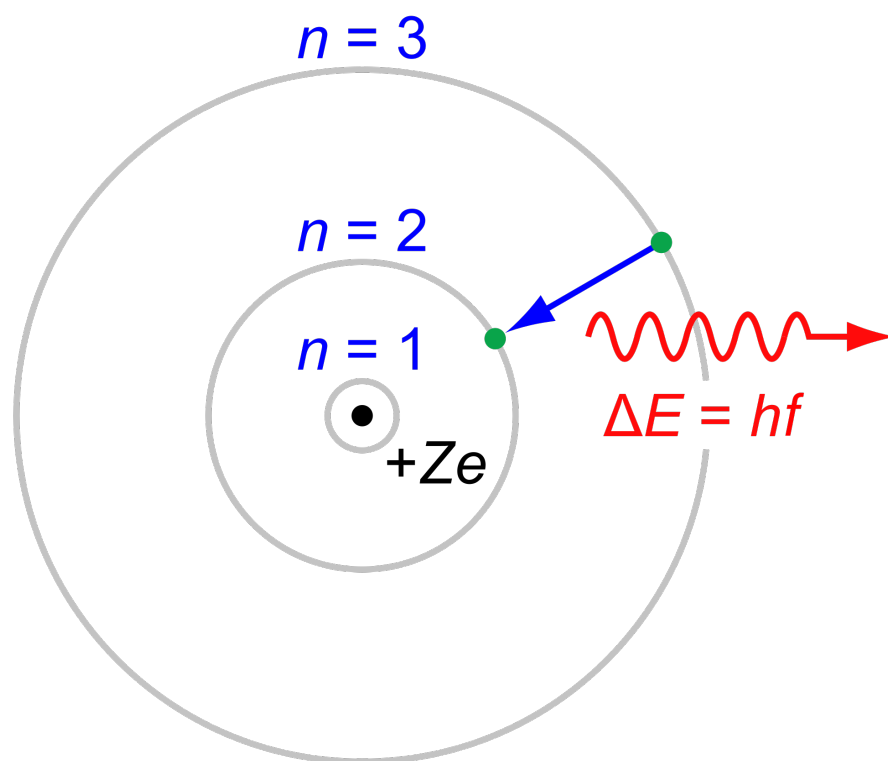


Photons, Electrons



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1 What is an electron? - 5min

The goal of this section is to see what every kid knows about electrons and to allow them to get progressively into the subject by thinking about it by themselves. Each kid should give their idea about what an electron is. At the end of these five minutes, the following explanation should be given to the whole group so that they have a good idea about what the activities are going to be related with: Electrons are **elementary particles** (which means that they are not made of a combination of other particles) that are part of the atoms, which are the building blocks of matter. Their mass is of 0.0000...(31 zeros !)...9 kilograms ! They are responsible for phenomena like electricity: an electric current is nothing but electrons hopping from atom to atom !

2 Electrons in the atomic structure - 10min

In the atom, electrons turn around the center of it just as planets turn around the Sun. Each electron describes a different orbit around the center of the atom. Ask the kids: What do you think is the difference between an electron that is in a big orbit, far away from the center of the atom and an electron that is in a tiny orbit, close to the center? Let them think about it and talk about their ideas. The answer is **energy**. An electron in a big orbit has more energy than an electron moving in a tiny orbit. Explain the kids that the energy levels are **discrete**, which means that there is a certain number of orbits and that the electrons are in one of them but they can not be at a distance of the center of the atom that is not one of the already defined orbits. Finally, ask the kids: Can electrons jump between two orbits? If so, are there restrictions for them? - We will answer these questions later.

3 What is a photon? - 5min

The goal of this section is to see what every kid knows about photons and to allow them to get progressively into the subject by thinking about it by themselves. Each kid should give their idea about what a photon is. At the end of these five minutes, the following explanation should be given to the whole group so that they have a good idea about what the next activity is going to be related with: Light is made of photons ! These are like little boxes containing **energy**. They travel around in straight lines and when they touch, for example, our eyes, we detect them and therefore see the object they come from !

4 How do electrons and atoms interact? - 25 min - [Activity]

We said that photons are like boxes containing energy, and that electrons in different orbits have different energies. Can you now answer the questions we raised before about what restrictions do the electrons have when changing their orbit? - Let the kids think about it for some minutes

Here is the answer and the activity:

When an electron jumps to a **lower energy orbit** he has to release a photon of the same energy.

When an electron receives a photon he jumps to a **higher energy orbit**, the energy difference between the orbits corresponding to the energy of the photon.

The activity:

Divide the students in groups, each of them around a table. Each group should draw a structure of orbits in an atom (see powerpoint) in a big paper sheet (mad of several sheets sticked together). They should also draw several electrons and photons in other paper sheets and cut them out so that they can use them in the activity. At the begining of the activity, each group should place lets say five electrons randomly in the orbits of their atom. Each group should have a dice.

We are now ready to proceed, and we will do so by steps: At the begining of every step every group chooses an electron. Thew throw the dice, if the result is 3 or less, nothing happens. If the result is 4 or more the electron gets to a lower orbit. A photon is therefore released. The group chooses to which other atom (other group) send the photon. They give the photon to that other group. That other group now chooses an electron and makes it go to a higher orbit. That is the end of a step, **take into account that in a 'step' of this activity, all the groups do what is just described at the same time. The steps are not group by group but every group does the procedure.** After the number of steps you decide, the game is over. Students should write down the original distribution of the elctrons in the energy levels of their atom and the one at the end of the game. The activity represents the evolution of a system with several atoms, compare the systems at the begining and at the end of the activity!

5 Different colours, different energies for photons - G+T

For 'G+T' kids, you should explain that in fact, the energy levels are not equally spaced. For example, the energy difference between levels one and two can be bigger that the one between levels two and three. How does that affect orbits and photons?

Orbits are not equally spaced, more energy difference corresponds to more distance between orbits (see powerpoint). Photons have therefore also different energies. The energy of a photon is related to the color, see the powerpoint for the color-energy relation!