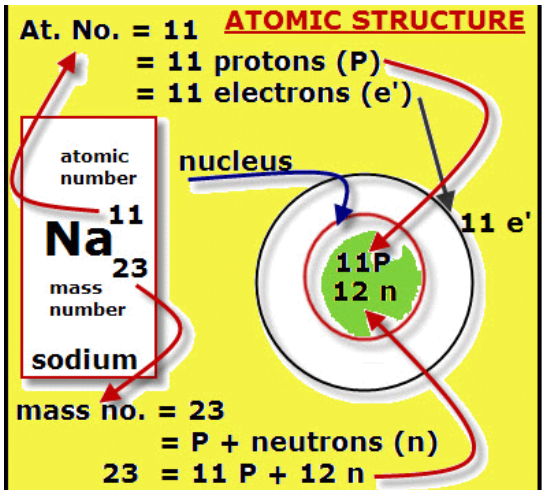
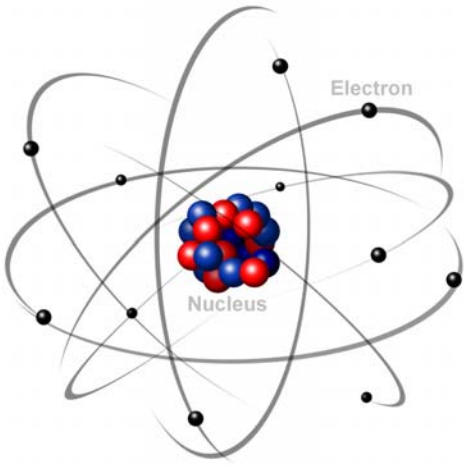
STATION 16 - Chemical Reactions

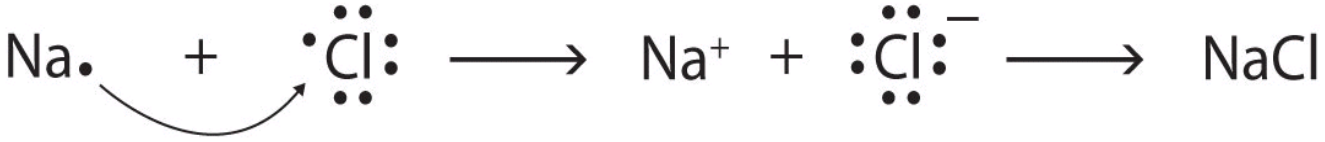
Chemistry is often called the central science. At the heart of chemistry are the reactions that convert one substance into another. What is it that changes in chemical reactions? To understand this concept, it is helpful to examine an atom. Atoms are composed of a small nucleus consisting of protons and neutrons surrounded by a cloud of electrons. The periodic chart is arranged according to the number of protons in the nucleus (the atomic number) and starts at 1 for hydrogen and goes up to 92 for uranium, the last naturally occurring element and up to 118 for elements synthesized using nuclear methods in the laboratory. The neutral atom also has an equal number of electrons.





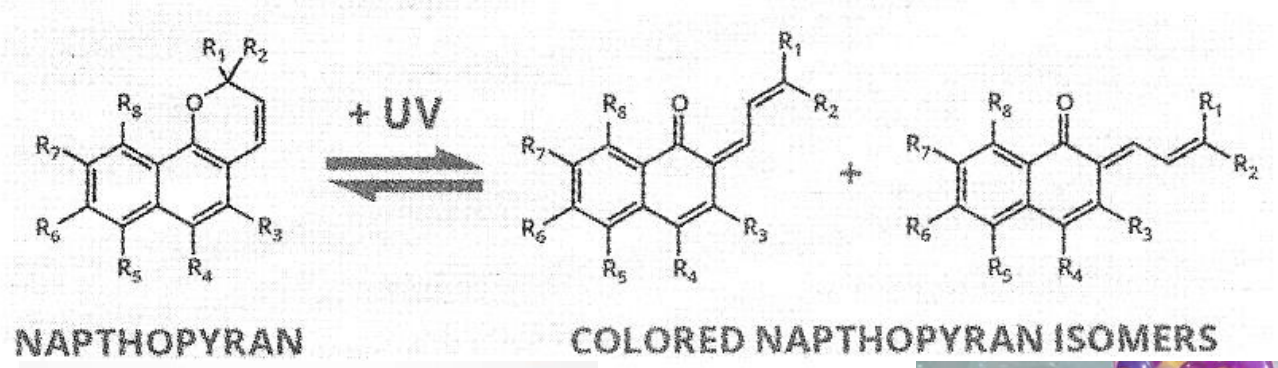
For example, the atomic number of sodium (Na) is 11. A Na atom has 11 protons and 11 electrons. The only naturally occurring isotope of Na has a mass number of 23 and 12 (23 - 11) neutrons. The model for Na (left) is oversimplified.

Chemical reactions are the result of the gain or loss of electrons or bonding changes (involve electrons only). The nucleus does not change in a chemical reaction. When a sodium atom reacts with chlorine atom [chlorine like many gases exists in nature as a diatomic molecule (Cl_2) but for simplicity, a chlorine atom will be used to demonstrate the reaction], an electron is transferred from the sodium ion to the chlorine atom. A sodium ion with a positive charge (cation) results that is strongly attracted to the now negatively charged chloride ion (anion) via an ionic bond.



In summary, chemical reactions are the result of the gain or loss of electrons yielding ionic bonds, the sharing of electrons yielding covalent bonds or the exchange of ionic partners. To illustrate chemical reactions in a museum exhibit presents challenges as chemicals need to be continually replenished and there are significant disposal issues. For this reason, reversible reactions are used in this station (photochromism) and in Station 19 (thermochromism).

Station 16 demonstrates a type of chemical reaction called photochromism. Ultraviolet (UV) light is a form of energy that is in the range of chemical bond energies. A UV light will be used to cause a chemical reaction in compounds in plastic beads. This particular reaction is reversible and the photochemical products should revert to the starting materials in the absence of UV light.



Are your observations consistent with the comments above?