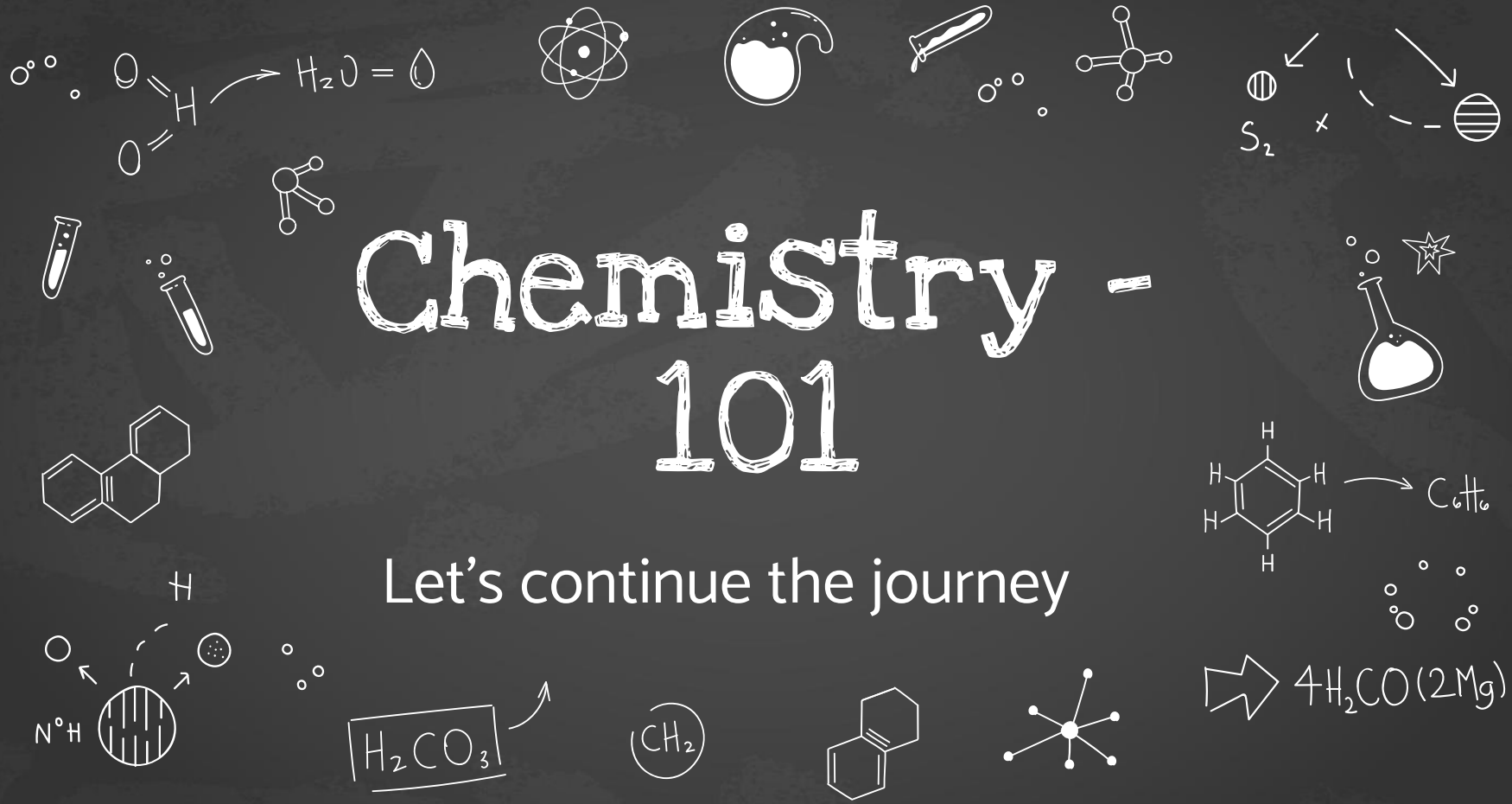
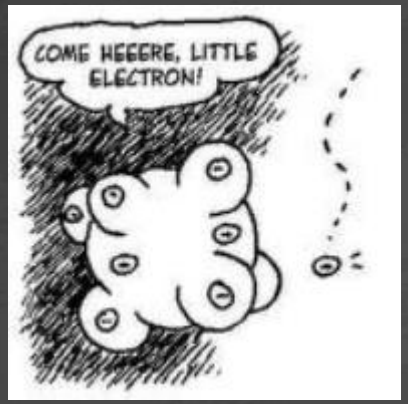
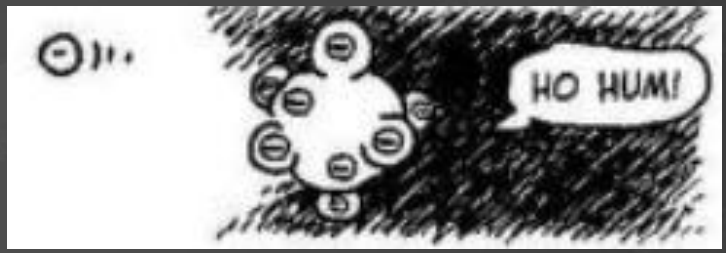

Chemistry - 101
Let’s continue the journey

A complete outer shell, ns^2np^6, is energetically more advantageous than an incomplete one.

We call it the **RULE OF EIGTH**: at atom tends to pick up or give away just enough electrons to make eight in its outer shell - AN **ELECTRON OCTET**.

Electron donor and electron acceptor properties of atoms are related to the octet rule





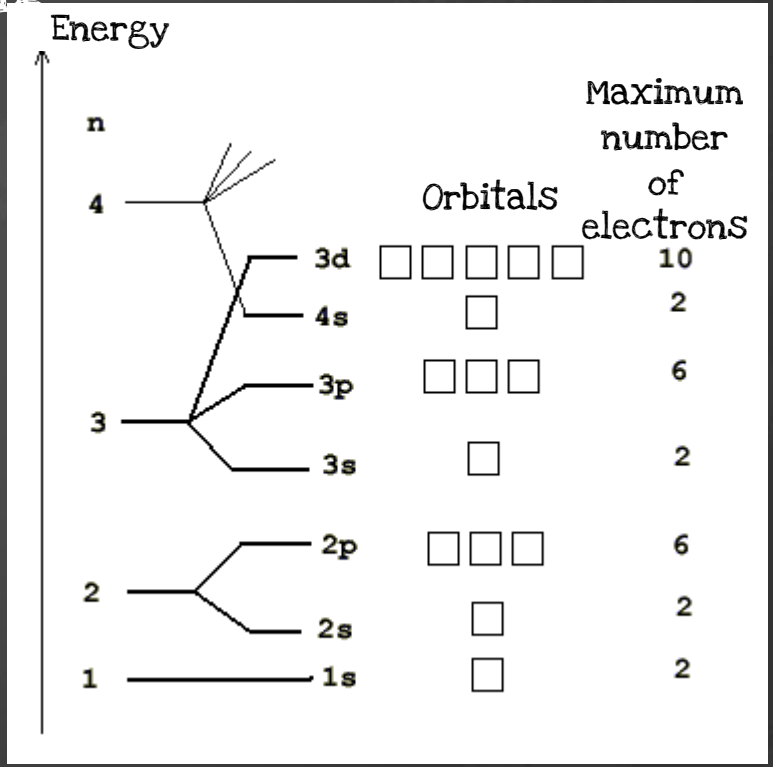
The donors tend to achieve the octet by giving up the electrons from their outer shell and the electron acceptors tend to get octet by accepting the electrons to their outer shells

Donors are atoms that just start filling their outer shells and strong acceptors almost finished building their octets

Let's look at $_{11}Na$ and $_{9}F$:

F: $1s^2\underline{2s^2 2p^5}$

Na: $1s^2 2s^2 2p^6 \underline{3s^1}$



For atoms with similar electron configurations the donor-acceptor properties depend also on how far is the outer shell from the nucleus.

Small atoms with few shells the outer shell electrons are more tightly held by the nuclei then in big atoms with remote outer shells

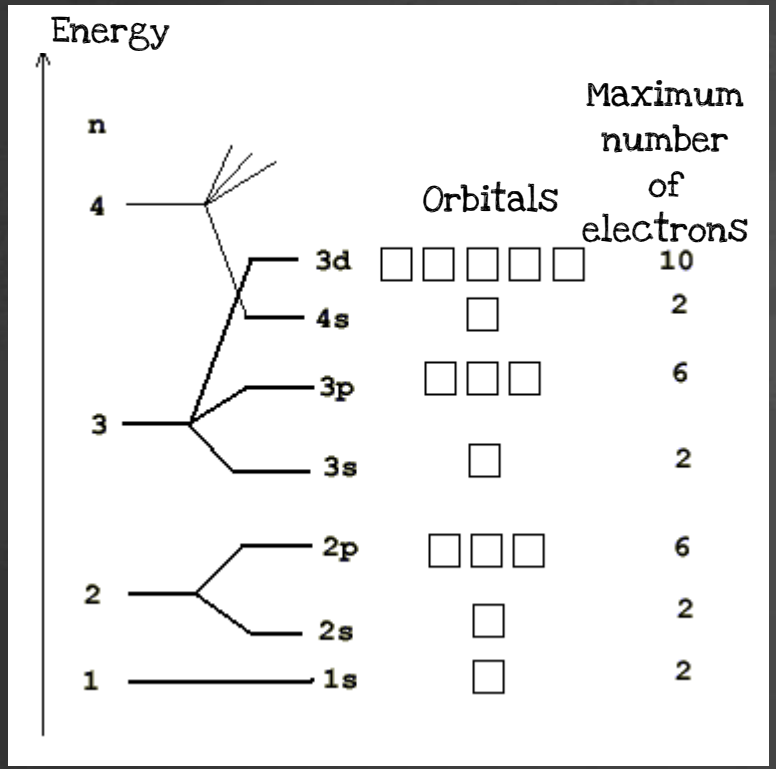
Let's compare $_{9}F$ and $_{17}Cl$:

F: $1s^2\underline{2s^2 2p^5}$
Cl: $1s^2 2s^2 2p^6 \underline{3s^2 3p^5}$

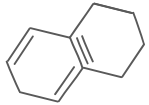
"F" is a stronger acceptor than "Cl". It was possible to combine it with the noble gases (Kr and Xe).

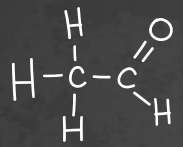
$_{36}Kr$

1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, ...



Kr: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$





Chemical bonds and chemical reactions - 1

How do atoms bind to each other to form molecules and how do molecules transfer into different molecules in chemical reactions?

$$a_{n+1} - a_n = 0n$$

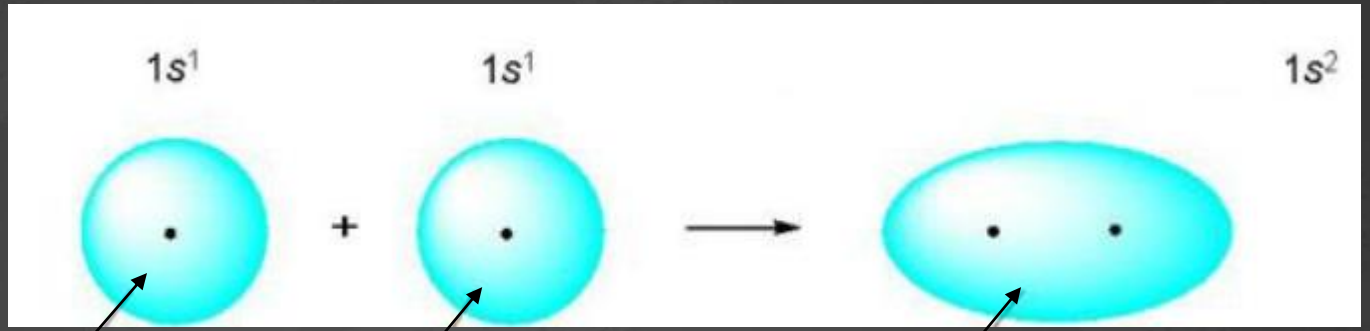
Types of chemical bonds

A complete outer shell, ns^2np^6, is energetically more advantageous than an incomplete one.

The outer shells of all elements except the noble gases are incomplete

In chemical interactions elements try to complete their outer shells

Covalent bond

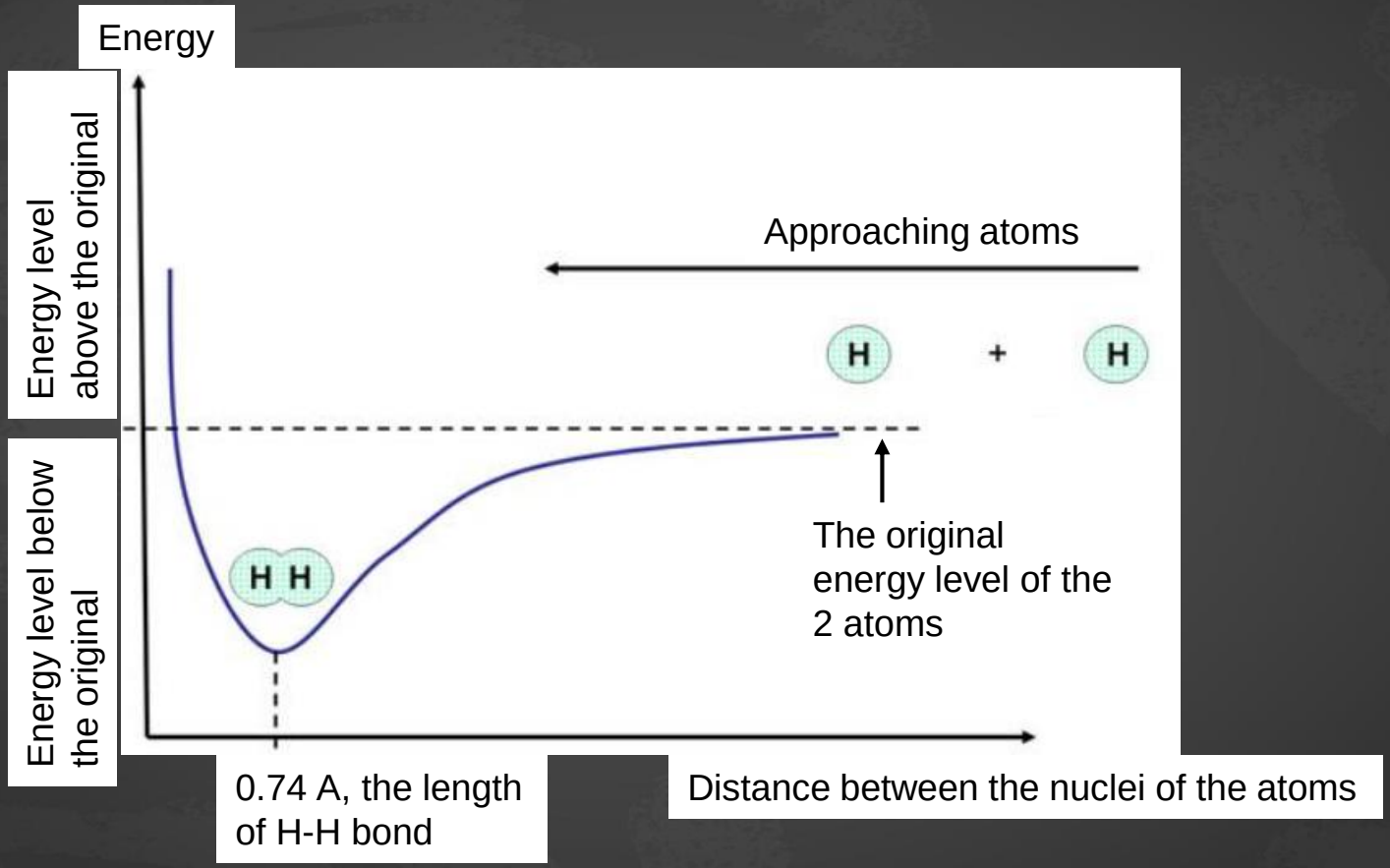


One electron | One electron | two electrons

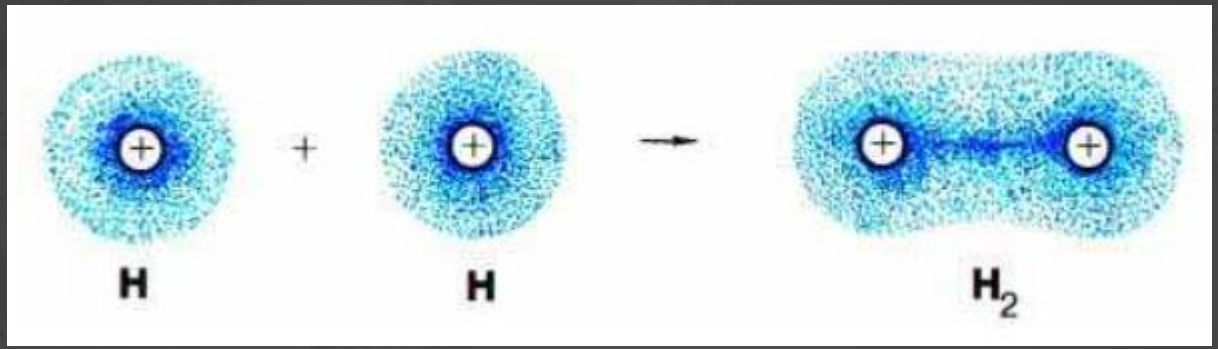
Alone, hydrogen atom has an unpaired electron. When one hydrogen encounters another, their electrons naturally pair up in a single shared orbital

The pair of electrons pulls on both nuclei, so it holds the atoms together. The bond is called covalent. Because both atoms contribute equally. Each hydrogen gets 2 electrons, so the resulting molecule H_2 is stable.

Bond length


Energy
Energy level above the original
Energy level below the original
Approaching atoms
H
+
H
H H
The original energy level of the 2 atoms
0.74 A, the length of H-H bond
Distance between the nuclei of the atoms

Electron density in the molecule



Or H-H

COVALENT BOND forms when atoms are bonding by shared pairs of electrons

This class uses the materials from the following books:
Larry Gonick and Graig Criddle “The cartoon guide to chemistry”
Manyuilov and Rodionov “Chemistry for children and adults”
Kuzmenko, Eremin, Popkov “Beginnings of chemistry”