Lesson Two: Composition, Let's Make Salt & Water!

Key Concept: **The importance of this lesson is to become more familiar with the electric charge of an element. You will explore the difference between composition and decomposition. This lesson will also help lead into the understanding of how a fuel cell works and what the benefits are.**

Two Activities for this lesson:

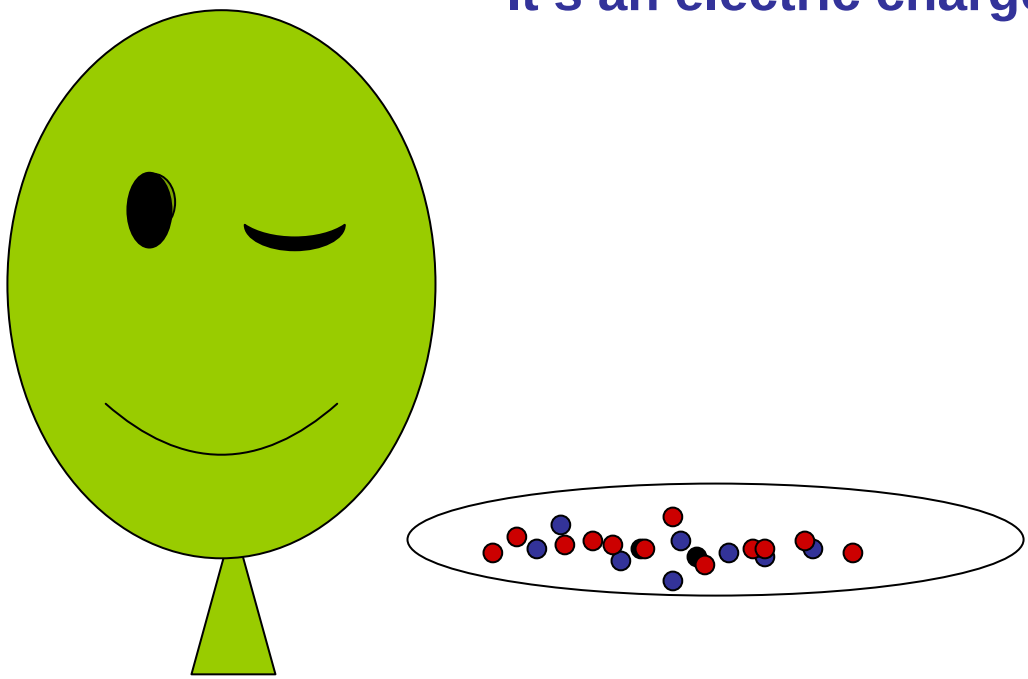
First activity uses a balloon, salt and pepper to show static electricity. The second activity shows composition of elements by playing the chemical equation game.

Important words:

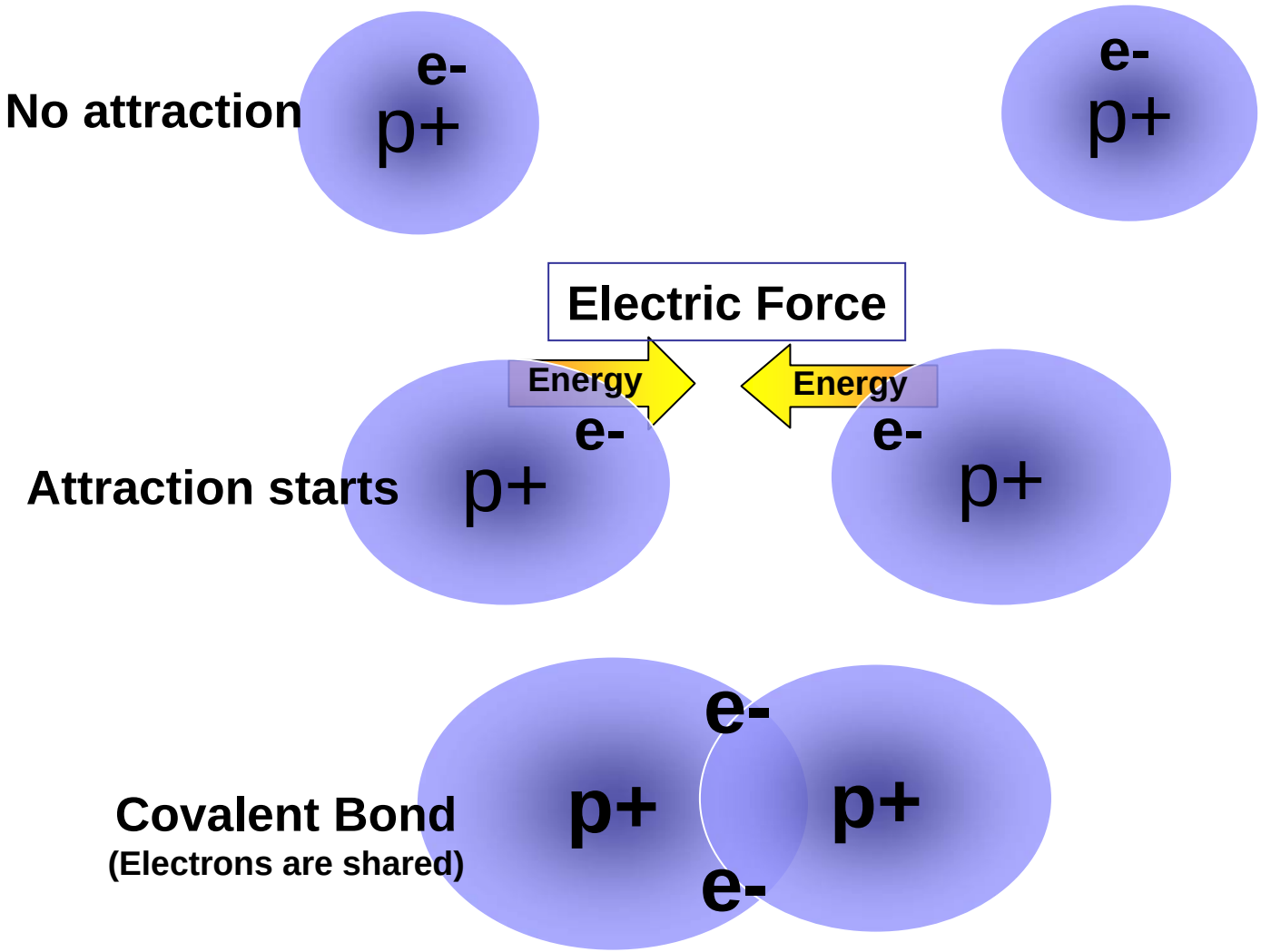
Composition Decomposition Energy

Lesson Two: Activity One

You've all heard of static electricity. You know that thing that happens when you rub your head with the balloon and watch your hair stand on end. Lets think about what happens for the split second the confetti leaves the plate and attaches itself to the balloon. It's an electric charge!



Here's what happens with two atoms…



Idea taken from CHEMISTRY, The Molecular Nature of Matter and Change, Martin Silberberg, Copyright 1996 by mosby-Year Book, Inc. pg. 62.

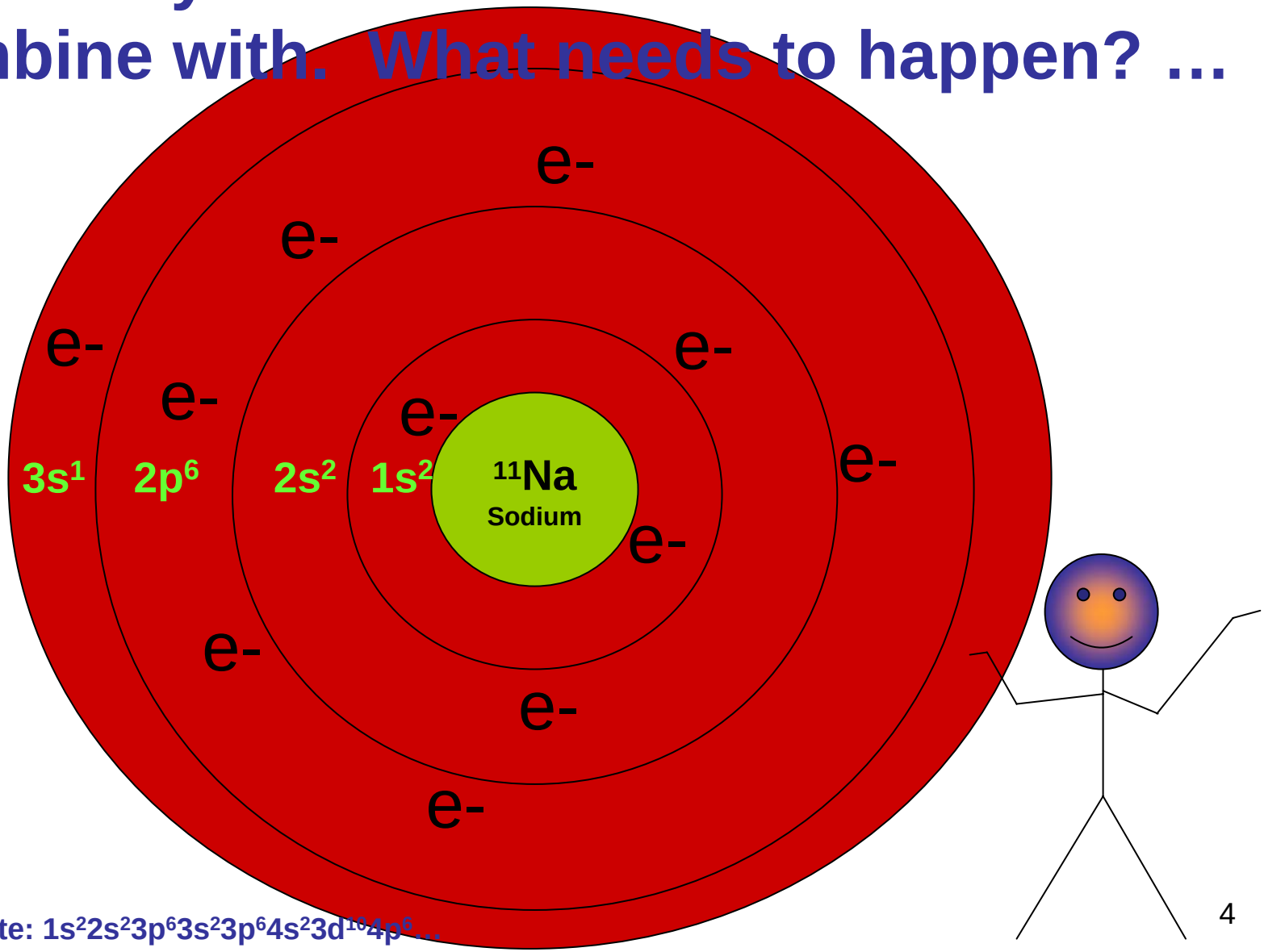
Another kind of bond is called *ionic*. An ionic bond is were an electron is transferred from one element to another. An ionic bond forms between a metal and non-metal.

The first two atoms are too far apart to be attracted to each other.

As the distance gets less the nucleus of each atom starts to attract the electron of the other.

Finally the bond forms. The elements are combined with other elements.

This Sodium Element is not satisfied and naturally seeks out another element to combine with. What needs to happen? …

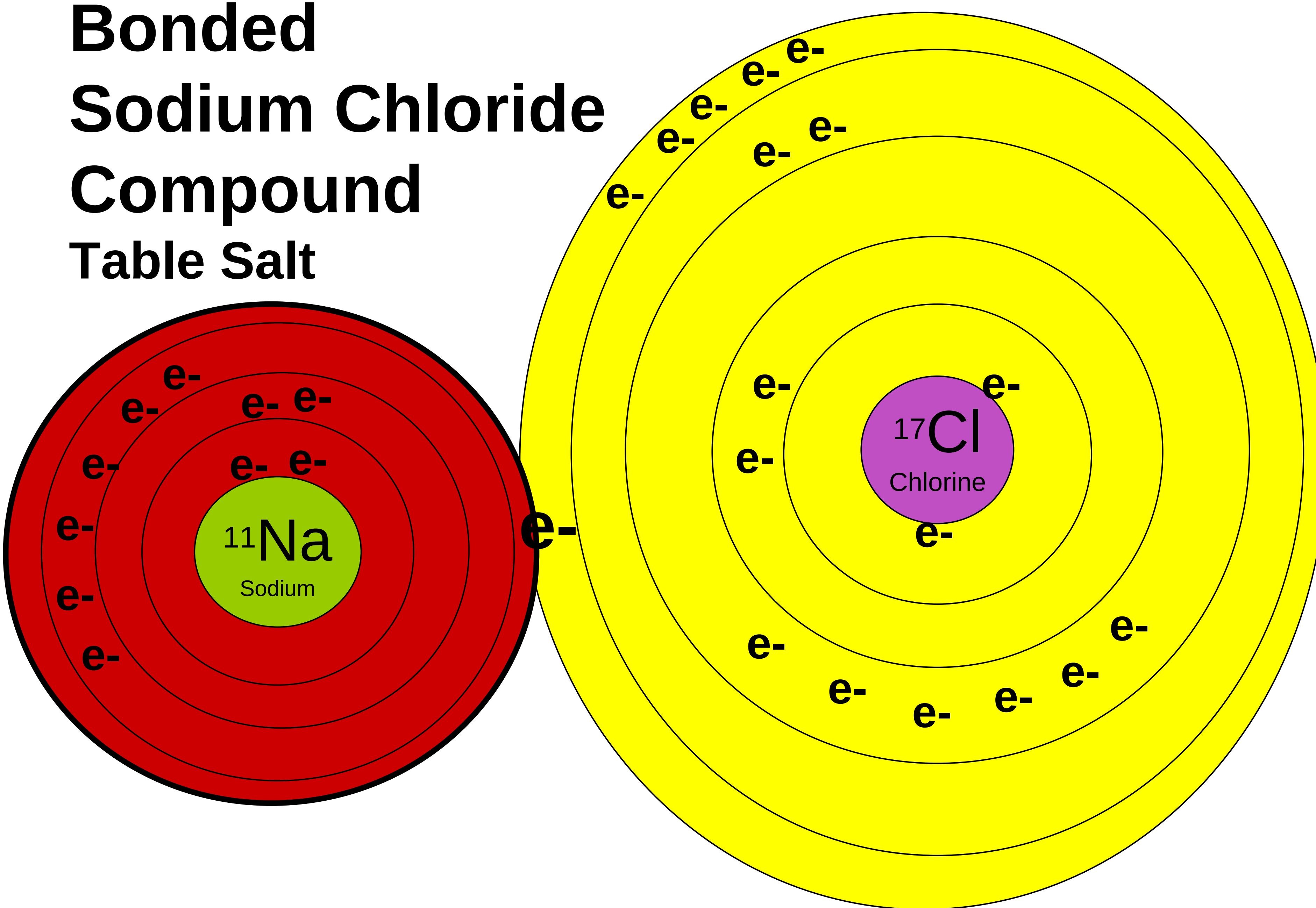


Teacher note: $1s^2 2s^2 3p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$…

Sodium needs to find an element friend. How about Chlorine?

Bonded Sodium Chloride Compound

Table Salt



note: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$…

Here are some important facts about elements we like, …

Sodium

Atomic Symbol	Na
Atomic Number (Protons)	11
Atomic Weight (Protons & Neutrons)	22.989768
Oxidation States (a way to keep track of Electrons)	+1
State at room temp.	Solid, Metal
Melting Point, K	370.96
Boiling Point, K	1156.1

http://ull.chemistry.uakron.edu/periodic_table/

T (in K) = T (in ^{o}C) + 273.15

Chlorine

Atomic Symbol		Cl
Atomic Number (Protons)		17
Atomic Weight (Protons & Neutrons)		35.4527
Oxidation States (a way to keep track of electrons)		+1,+5,+7,-1
State at room temp.		Gas, Nonmetal
Melting Point, K		172.2
Boiling Point, K		238.6

http://ull.chemistry.uakron.edu/periodic_table/

Hydrogen

Atomic Symbol		H
Atomic Number (Protons)		1
Atomic Weight (Protons & Neutrons)		1.00794
Oxidation States (a way to keep track of electrons)		+1, -1
State at room temperature		Gas, Non-metal
Melting Point, K SI unit base of temperature is Kelvin (K) T (in K) = T (in ^{o}C) + 273.15		14.01
Boiling Point, K		20.28

http://ull.chemistry.uakron.edu/periodic_table/

Oxygen

Atomic Symbol	O
Atomic Number (Protons)	8
Atomic Weight (Protons & Neutrons)	15.9994
Oxidation States (a way to keep track of electrons)	-2
State at room temp.	Gas, Nonmetal
Melting Point, K	54.8
Boiling Point, K	90.19

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Mercury

Symbol		Hg
Atomic Number		80
Atomic Weight		200.59
Oxidation States (a way to keep track of Electrons)		+1,+2
State at room temp.		liquid
Melting Point, K		234.28
Boiling Point, K		629.73

http://ull.chemistry.uakron.edu/periodic_table/

Chemical Equations

(Composition: Making a Compound)

(1+) and a (1-) has to equal (0)

Reactants **Product**

Na^{1+} (aq) + Cl^{1-} (g) —Energy→ NaCl (s) (Salt)

sodium chloride

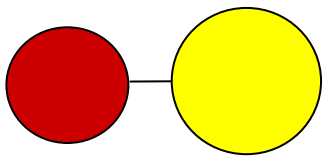
Chemical Equations

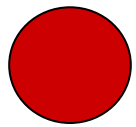
(Decomposition: Breaking compound apart)

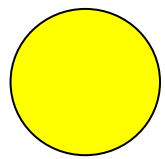
Product **Reactants**

$NaCl\ (s)$ (Salt) $\xrightarrow{\text{Energy}}$ $Na^{1+}(aq) + Cl^{1-}(g)$

Sodium Chloride — Sodium — Chlorine







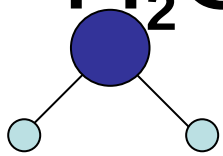
Chemical Equations

Composition

Reactants **Products**

(2+) and a (2-) has to equal (0)

$H^{1+}_2(g) + O^{2-}(g) \xrightarrow{\text{Energy}} H_2O$ (Water)

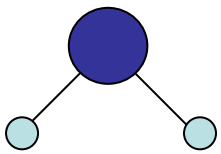


Chemical Equations

Decomposition

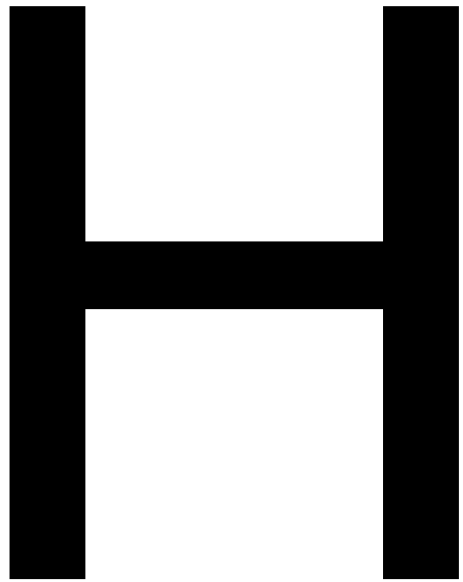
Product **Reactants**

H_2O (Water) $\xrightarrow{\text{Energy}}$ $H^{1+}{}_2(g) + O^{2-}(g)$



1 Electron (1+ or 1-)

Atomic Number 1

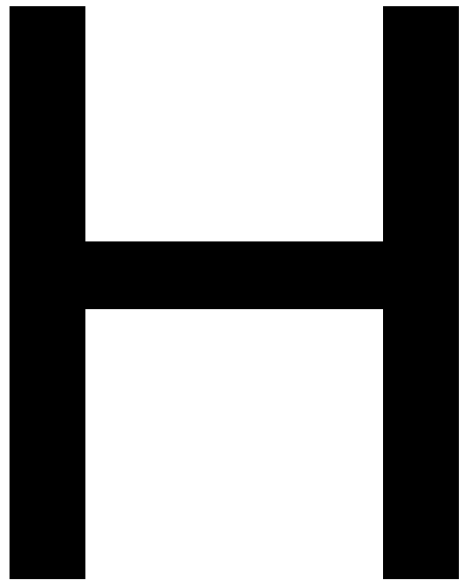


Hydrogen

1.008 (Atomic Mass)

1 Electron (1+ or 1-)

Atomic Number 1



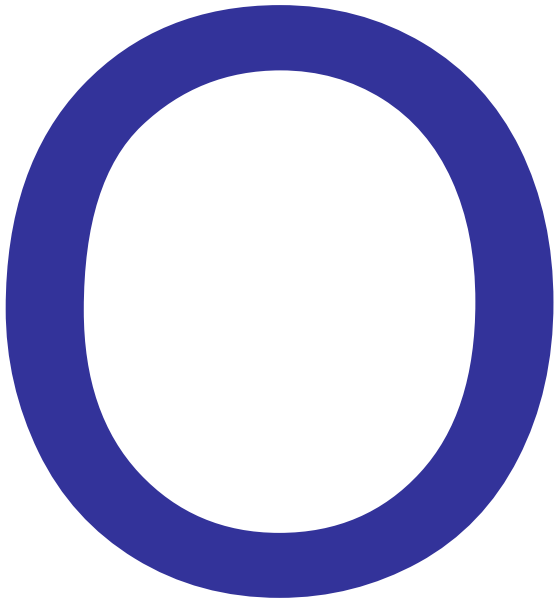
Hydrogen

1.008 (Atomic Mass)

6 Electrons (2-)

In outermost shell

Atomic Number **8**

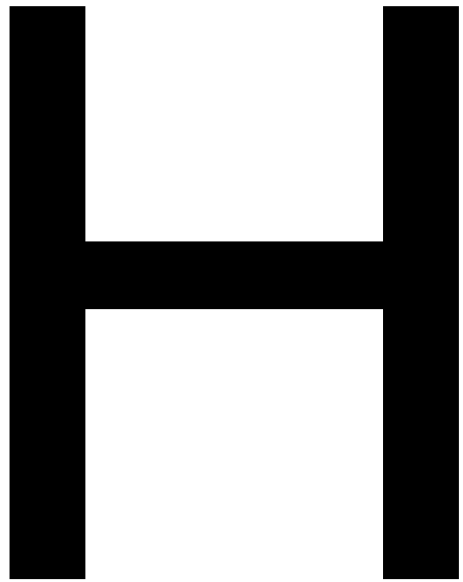


Oxygen

16.00 (Atomic Mass)

1 Electron (1+ or 1-)

Atomic Number 1

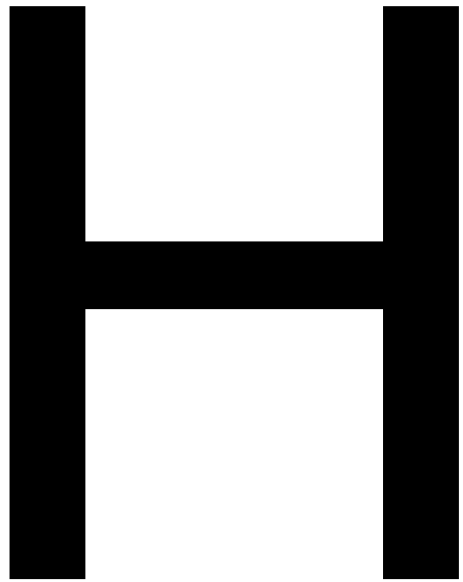


Hydrogen

1.008 (Atomic Mass)

1 Electron (1+ or 1-)

Atomic Number 1



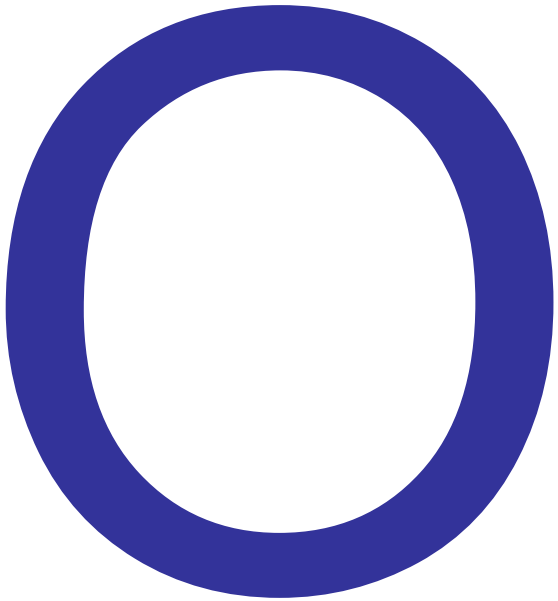
Hydrogen

1.008 (Atomic Mass)

Atomic Number 8

6 Electrons (2-)

In outermost shell



Oxygen

16.00 (Atomic Mass)

1 Electron (1+)

In outermost shell

Atomic Number
11

Na

Sodium

23.00 (Atomic Mass)

7 Electrons (1+, 5+, 7+, 1-)

In outermost shell

Atomic Number **17**

Cl

Chlorine

35.45 (Atomic Mass)

Atomic Number
11

1 Electron (1+)
In outermost shell

Na

Sodium

23.00 (Atomic Mass)

7 Electrons (1+, 5+, 7+, 1-)

In outermost shell

Atomic Number **17**

Cl

Chlorine

35.45 (Atomic Mass)

Some Common Elements

Metals:

Sodium (^{11}Na), Magnesium (^{12}Mg), Potassium (^{19}K), Lead (^{82}Pb), … Transitional metals - Aluminum (^{13}Al), Iron (^{26}Fe), Nickel (^{28}Ni), Copper (^{29}Cu), Silver (^{47}Ag), Gold (^{79}Au), …

Metalloids:

Boron (^{5}Br), Silicon (^{14}Si), Arsenic (^{33}As), Antimony (^{51}Sb), …

Nonmetals:

Hydrogen (^{1}H), Oxygen (^{8}O), Carbon (^{6}C),(diamonds, graphite, anthracite), Sulfur (^{16}S), Chlorine (^{17}Cl), Bromine (^{35}Br), and Iodine (^{53}I), …

Some Questions:

What is the difference between composition and decomposition? Give examples.

Where are the metals located on the periodic table? Non-metals? Metalloids?

Name some metals, metalloids, non-metals.

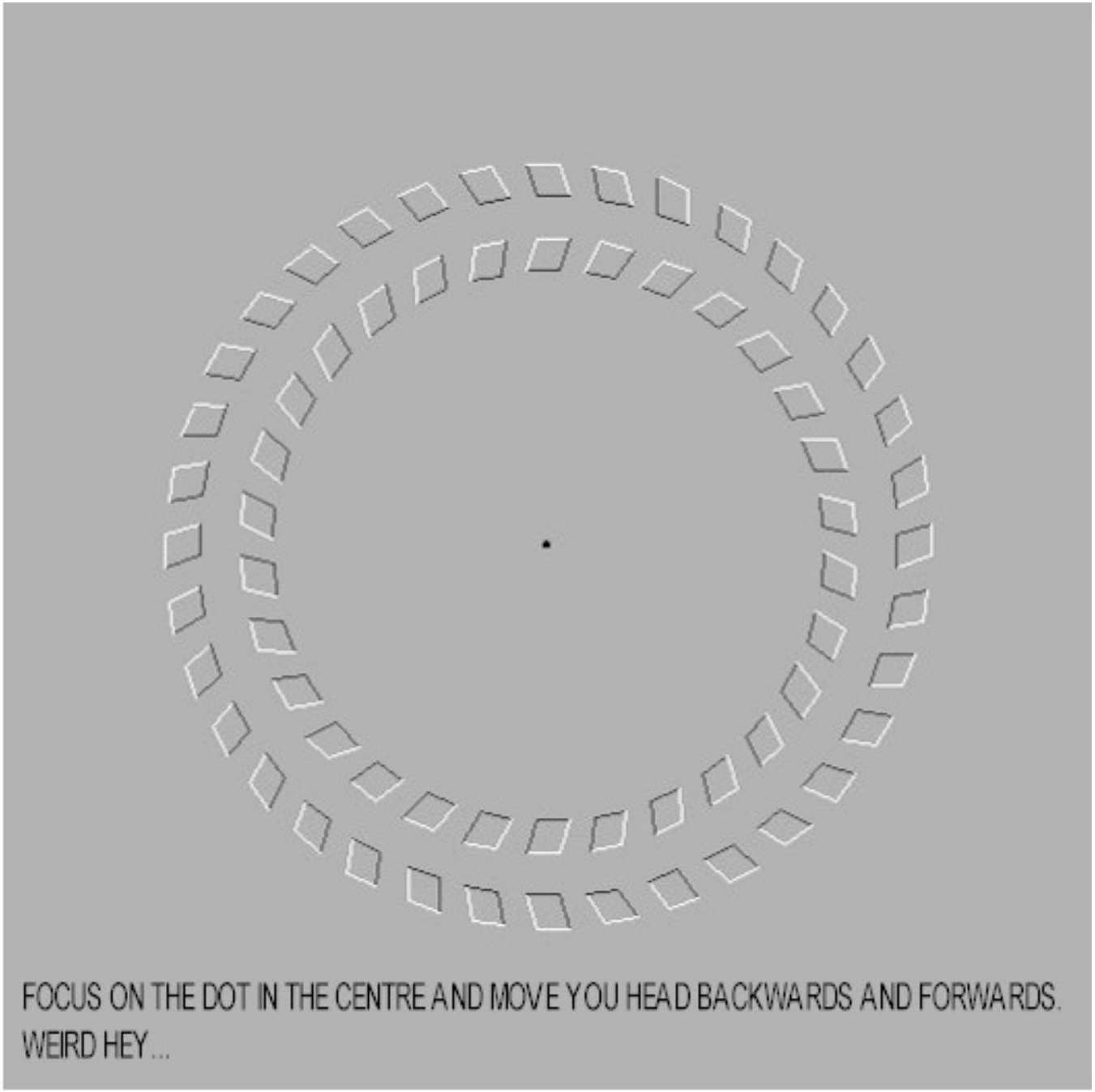
Lets see if you remember…

What is the atomic number?

What is the periodic table?

What is the atomic mass number?

Who was Dmitri Mendeleyev?


FOCUS ON THE DOT IN THE CENTRE AND MOVE YOU HEAD BACKWARDS AND FORWARDS.
WEIRD HEY...

CERTIFICATE OF *Participation*

PRESENTED TO

_____

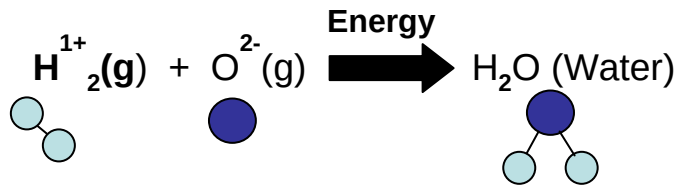
Future Fuel Cell Scientist of America

For Completing Lesson Two:
Composition and Decomposition

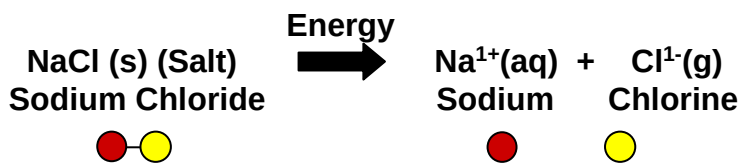
Mentor: _____

Chemical Equations

Composition



Decomposition



End of Lesson Two