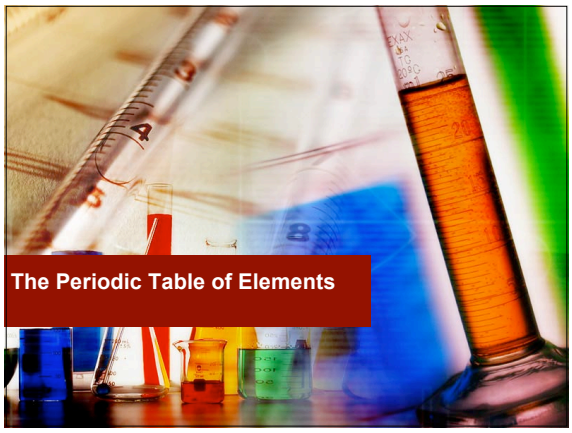

1. And now a song about elements

You can find this video and ALL
The videos for this powerpoint
In the chp 13 video library
Found in the directory.

2. And now Bill Nye: Atoms-Part 3

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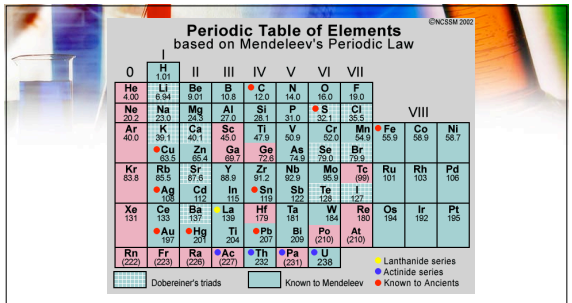
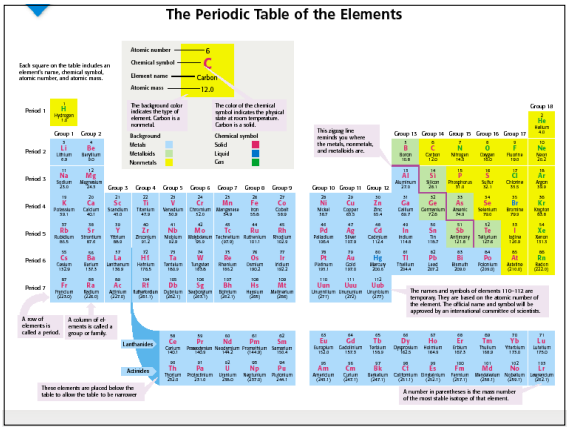
Dmitri Mendeleev (1834-1907)

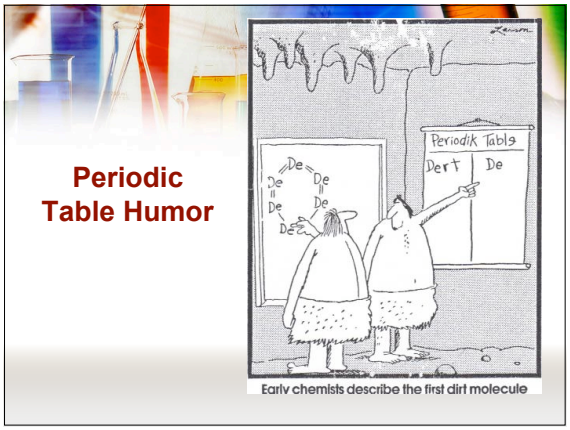
- A Russian chemist attempted to organize the elements based on information such as density, appearance, atomic mass, and melting point.
- After much work he determined that there was a **repeating pattern** to the properties when the elements were arranged in order of increasing atomic mass.



- In this order, certain chemical properties of the elements were "**periodic**" meaning that they had a regular repeated pattern.
- There were still some missing elements, but he predicted that those were elements yet to be discovered.

- In 1914 Henry Moseley determined that the elements should be arranged by the number of **protons** - the **atomic number** - and the periodic table was rearranged using this method, which greatly improved the arrangement of elements.





3. The Periodic Table & Elements

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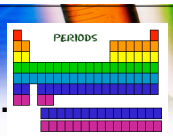
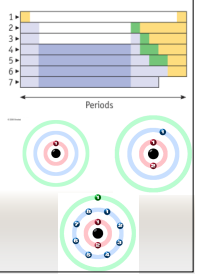
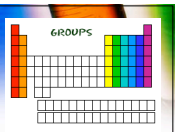
You've got your Periods..



- Periods = **rows** From left to right
- What do elements in a row have in common?
  - the same number of **electron shells**
- Every element in Period 1 (1st row) has 1 shell for its electrons (H & He)
- All of the elements in period 2 have two shells for their electrons.
- It continues like this all the way down the table
- The elements in a row become less metallic from left to right

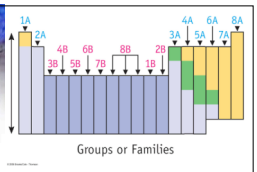


And You've got your groups



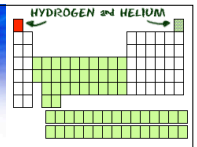
- Column = **group** = **families**
- What do elements in a group have in common?
  - same number of **valence electrons** (electrons in the outer shell)
- Every element in group 1 (1st column) has 1 valence electron
- Every element in group 2 has 2 valence electrons.
- In fact, if you know the group's number, you automatically know how many valence electrons it has!

Group Labels



- Labeling the groups can be confusing because the rules change with the middle transition elements.
- The transition elements get grouped together as the "B" elements, or groups #1B - 8B.
- All of the other elements are "A" elements, with groups #1A - 8A.
- Using this labeling system will tell you exactly how many valence electrons are in the atoms.
- However, sometimes the groups are just labeled #1-18.

Two at the Top



- **Hydrogen** (H) and **helium** (He) are special elements.
- Hydrogen can have the talents and electrons of two groups, one and seven.
- Sometimes it is missing an electron, and sometimes it has an extra.
- Helium is different from all of the other elements.
- It can only have two valence electrons
- Even though it only has two, it is still grouped with elements that have eight.

Hydrogen: stands alone

- Gas,
- reactive,
- 1 electron in outer level.
- Hydrogen does not match properties of any single group so it is placed above Group 1.
- It can give it's electron away with ionic bonding, or share it's electron in covalent bonding

4. Hydrogen Reaction

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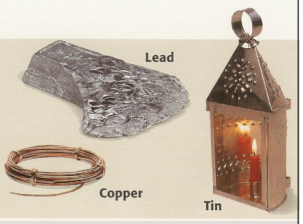
Periodic Table of Videos: http://www.periodicvideos.com/

Finding your way around the Periodic Table:

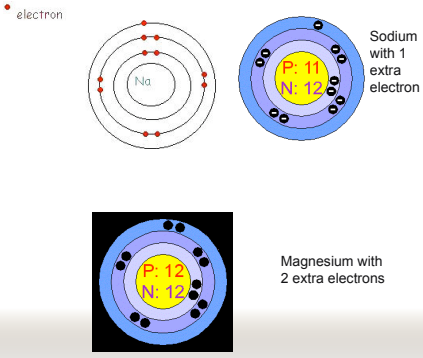
3 classes of elements

Metals

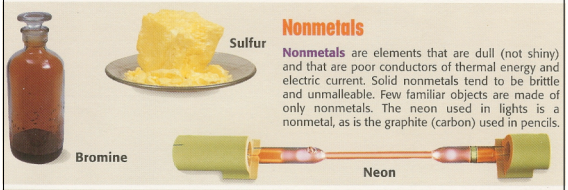
Metals are elements that are shiny and are good conductors of thermal energy and electric current. They are easily shaped into different forms because they are *malleable* (they can be hammered into thin sheets) and *ductile* (they can be drawn into thin wires). Iron has many uses in building and automobile construction. Copper is used in wires and coins.



Atoms of most metals have few electrons in their outer energy level

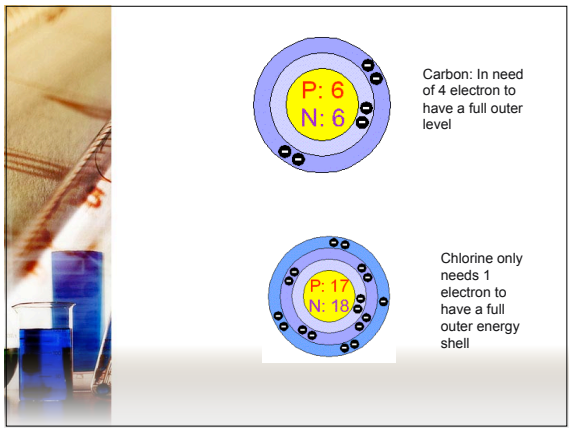


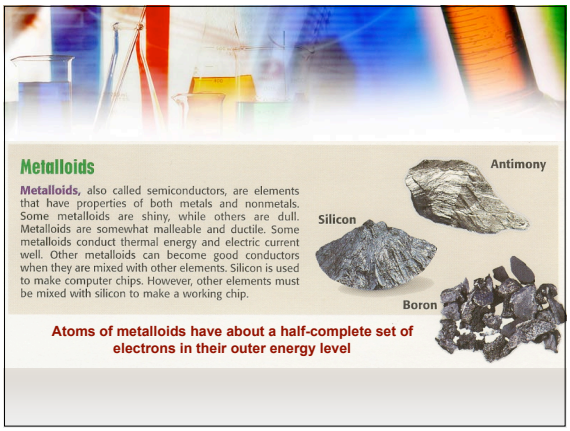
Nonmetals

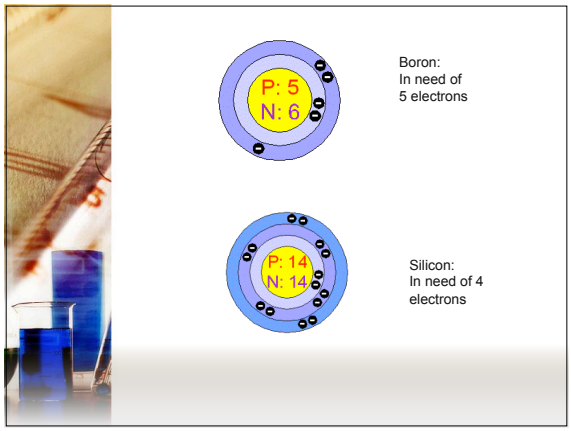


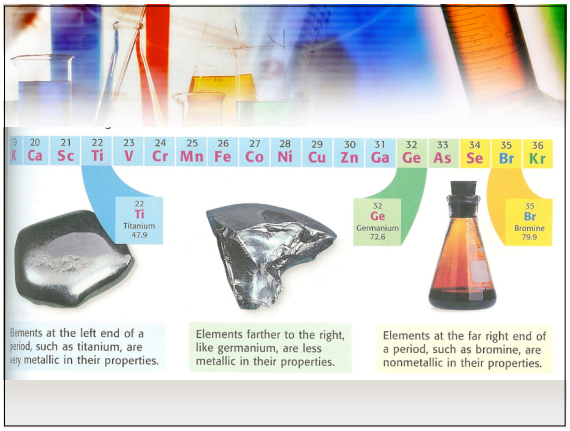
Nonmetals are elements that are dull (not shiny) and that are poor conductors of thermal energy and electric current. Solid nonmetals tend to be brittle and unmalleable. Few familiar objects are made of only nonmetals. The neon used in lights is a nonmetal, as is the graphite (carbon) used in pencils.

Atoms of most nonmetals have an almost complete set of electrons in their outer level



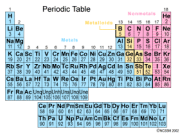






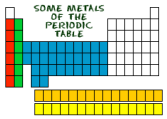
Metals, Metalloids, & Nonmetals

- Another pattern we find on the periodic table is that all of the metals are grouped together on the left & the nonmetals are on the right.
- The metalloids fall in between, near the zigzag line.
- This trend isn't a coincidence.
- The number of **valence electrons**, or electrons in the outer shell, determines how an element acts.



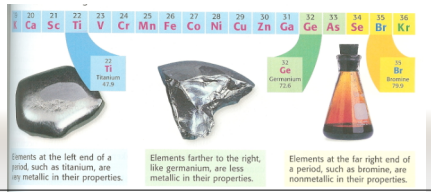
Metals, Metalloids, & Nonmetals

- For example, all of the metals have **few** valence electrons.
- This causes them to possess metallic properties such as, conductivity & reactivity.
- Conversely, the nonmetals on the right of the periodic table have **almost** complete sets of electrons in their outer level.
- Therefore, they possess nonmetallic traits such as dullness, poor conductivity, and brittleness.



Metals, Metalloids, & Nonmetals

- We can summarize all of this just by saying:
- Elements get less metallic as you move from left to right.

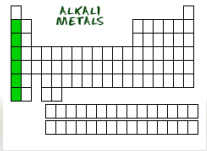


Families Stick Together

- Scientists group families of elements by their **chemical properties**.
- Each family reacts a different way with the outside world.
- BUT, elements within a family are similar to one another.
- Metals behave differently than gases and there are even different types of metals.
- Some don't react, others are very reactive, and some are metallic.
- Let's go over the periodic table families…

Family #1 or 1A: Alkali Metals

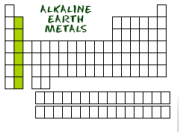
- Li , Na , K , Rb, Cs, Fr
- **Very** Reactive
- **1** valence electron



- All have ONE outer electron to lose.
- Sodium is used in street lights, and different compounds are used in detergent, paper, glass & soap.
- This makes them highly reactive, since they are looking to combine with another element to become stable and have that outer level filled and complete (or happy!).
- They are the most reactive of all metals
- These are also soft and can be cut with a knife.

Family #2 or 2A: Alkaline Earth Metals

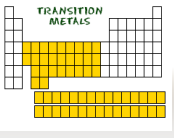
- Be, Mg, Ca, Sr, Ba, Ra
- **very** reactive, but less than alkali metals
- **2** valence electrons



- Not as reactive because it is harder to give two electrons away than just one.
- Potassium is used in fertilizer and with chloride.
- These elements are typically what are lost in perspiration which is why people buy special sport drinks that contain these elements!
- Calcium is in milk
- Magnesium is in Fireworks.

Family #3-12 (1B-8B): **Transition** Metals

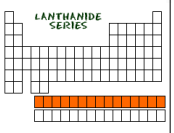
- **1-2** valence electrons
- **Less** reactive than alkaline earth metals because they don't give away their electrons as easily



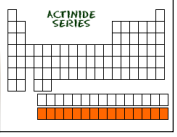
- In these "short families" the properties are very much alike.
- Most have high melting points and are hard.
- Have 1 or 2 properties like the alkali or alkaline earth families.
- Group 11 = The **Copper** Family: are the coinage metals (Cu, Ag, Au) used to make currency

Family #3-12 (1B-8B): Transition Metals

- **Lanthanide** Series:
  - 15 elements that start with lanthanum (La) at atomic number 57 and finishing up with lutetium (Lu) at number 71
  - shiny reactive metals
  - Most found in nature

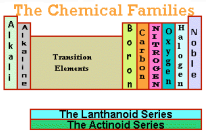


- **Actinides** Series:
  - 15 elements that start with actinium (Ac) at atomic number 89 and finishing up with lawrencium (Lr) at number 103.
  - radioactive and unstable
  - Most are man-made & not stable in nature



Group 13: The Boron Group

- One metalloid and 4 metals
- B, Al, Ga, In, Tl
- **3** electrons in the outer energy level
- Reactive
- **Solid** at room temperature
- Most common element in this group is **aluminum**

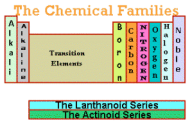


- Boron is most commonly found as borax and boric acid, which are used in cleaning compounds.
- Aluminum is the third most common element in the earth's crust. It is used as a coating agent, to prevent oxidation. It is an excellent conductor of electricity and heat and can be found in many cooking utensils.

#14 or 4A: Carbon Family

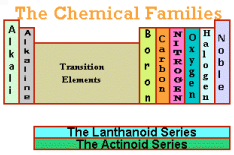
- C, Si, Ge, Sn, Pb
- 1 metal, 1 metalloid, and 2 nonmetals.
- **4** valence electrons

- No other group has a greater range of properties.
- They have the unique ability to form chainlike compounds.
- This family is incredibly important in the field of **technology**.



#15 or 5A: Nitrogen Family

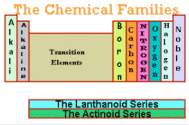
- N, P, As, Sb, Bi
- 2 nonmetals, 2 metalloids, 1 metal
- **5** valence electrons
- Reactivity varies



#16 or 6A: Oxygen Family

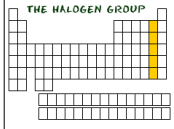
- O, S, Se, Te, Po
- 3 nonmetals, 1 metalloid, 1 metal
- **6** valence electrons
- reactive

- Most members form covalent compounds
- Must share 2 electrons with other elements to form compounds.
- Oxygen is one of the most reactive nonmetallic elements.



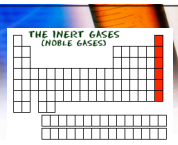
Family #17 or 7A: Halogens

- F, Cl, Br, I, At
- **very** reactive
- **nonmetals**
- **7** valence electrons



- They are very reactive because have 7 valence electrons, this means they are ALMOST full and can combine with many elements.
- Halogen elements combine with metals to form compounds called **salts**.
- Halogen means "salt-producer".
- The combine with a metal by ionic bonding.
- They are the most reactive of the nonmetals families.
- As you move down the column, the elements get less reactive.
- A halide is when a halogen combines with another element (NaCl)

Family #18 or 8A: Noble Gases



- He, Ne, Ar, Kr, Xe
- Nonmetals
- NON REACTIVE gases
- NO bonding with other elements
- **8** valence electrons (except He which only has 2)

- With the exception of He, these elements have 8 electrons in their outer energy level.
- Very stable
- They are **inert**, meaning they don't react with anything.
- Why? Because they're happy!
- All of these elements have full outer shells
- Colorless, odorless gases at room temperature
- Often used in neon products/neon lights
- All are found in Earth's atmosphere
- Only in laboratories can scientists force these to bond with other elements.

5. Chemical Music Video

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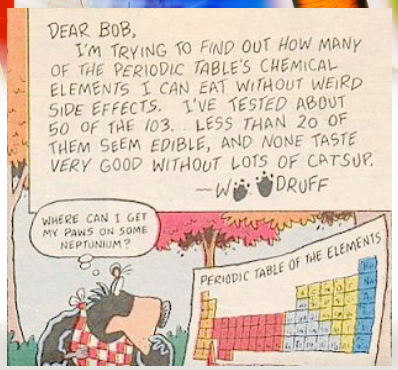
And now a word from Brainpop

- The Periodic Table of Elements:
- Brainpop

BrainPop Answers

- 1. A
- 2. B
- 3. A
- 4. B
- 5. B
- 6. A
- 7. B
- 8. C
- 9. B
- 10. B

More Periodic Table Humor



6. Meet The Elements

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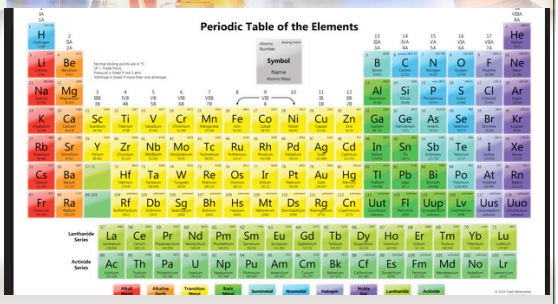
Little Book Work

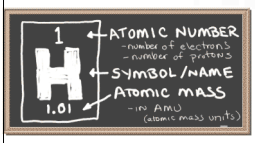
- We're going to take some class time to get you going on your little book pages,

but before we do that, I want to go over exactly what you find in the periodic table boxes and how that information is going to help you complete your work

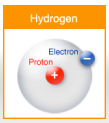
The Periodic Table



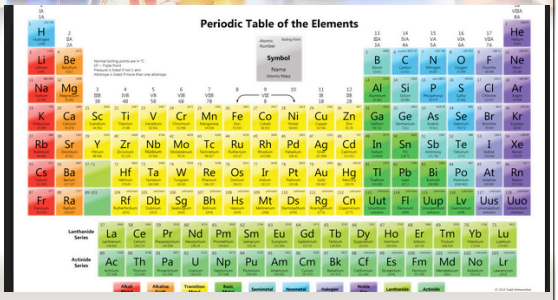
The #1 Element: Hydrogen



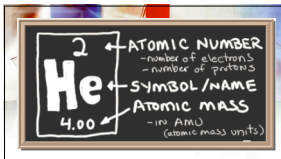
- Look at hydrogen.
- It's atomic number is 1, which means it has 1 proton in the center of the atom.
- Because the atom should be neutral, we need to add 1 electron to the outside.
- The two opposite charges cancel and we're left with one happy, neutral atom.



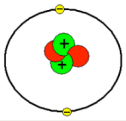
The Periodic Table



Let's make a Helium!

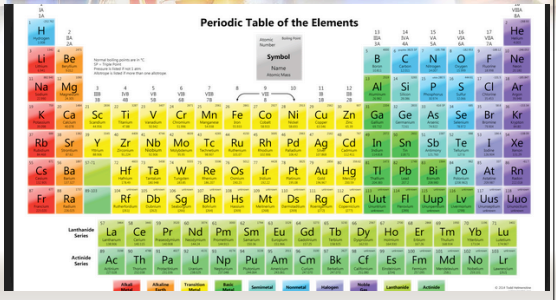


A Helium Atom

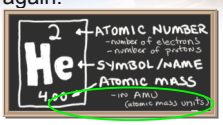


- **Step 1:** Have 2 protons
  - **(since the atomic # is 2)**
- **Step 2:** Have 2 neutrons
  - **(since the 2 protons repel one another, the nucleus is unhappy & needs some inner peace)**
- Step 3: Have 2 electrons (-2)
  - **(since we want a happy atom & we need two negatives to balance the two positives)**

The Periodic Table



- Let's look at this Helium atom again.
- So far you've learned about:
  - **Atomic Number**
  - **Symbol/Name**
  - **The element's family**

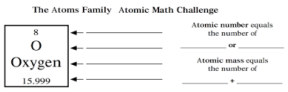


- What's this atomic mass thing???
- It's the total of the protons & neutrons in the nucleus. (remember: electrons are so tiny we give them a 0 (zero) mass
- Atomic Mass is the number of **protons + neutrons**.

Go to your Little Book Page 6

The Atoms Family Atomic Math Challenge

Little Book Pg 6



8 = Atomic number

Atomic Number equals the number of: **Protons or Electrons**

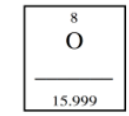
O = element symbol

Oxygen= element name

15.99= Atomic Mass (average!)

Atomic Mass equals the number of: **Protons + Neutrons**

Now YOU try it! Pg 6 Oxygen



Atomic # = _____
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____

Complete the empty blanks!

Oxygen (element name)

Atomic # (number) = 8

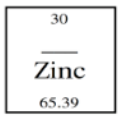
Atomic Mass =16(round it) (Protons+Neutrons)

Protons: 8 (the atomic number)

Neutrons: 8 (the atomic mass - #protons)

Electrons: 8 (# of Protons = # of electrons)

Now YOU try it! Pg 6



Atomic # = _____
Atomic Mass = _____
# of Protons = _____
# of Neutrons = _____
# of Electrons = _____

Complete the empty blanks!

Zn (element symbol)

Atomic # (number) = 30

Atomic Mass =65(round it) (Protons+Neutrons)

Protons: 30 (the atomic number)

Neutrons: 35 (the atomic mass - #protons)

Electrons: 30 (# of Protons = # of electrons)

Little Book: Page 8 Atomic Math

This is similar to the last part on your lecture notes

Element	Atomic #	Atomic Mass	Protons	Neutrons	Electrons
Hydrogen			1		
	9				
		23			11
Chlorine					
		56	26		
					47
		195			
Radon					
	90				

Remember what you've learned!

Atomic Number = # Protons AND # Electrons

Protons = Electrons

Atomic Mass – Protons= # of neutrons

Protons + Neutrons = Atomic Mass

Valence Electrons? Look at the group number

Atomic Math

Using the periodic table, & the information just learned to complete this chart

Element	Atomic #	Atomic Mass	Protons	Neutrons	Electrons
Hydrogen	1	1	1	0	1
	9				
		23			11
Chlorine					
		56	26		
					47
		195			
Radon					
	90				