4. Where do the names of the elements come from?

Some were named as substances before they were known to be elements.







silver 47 sulfur 16

copper 29

Some are named from the natural substance that they are found in.







borax boron 5 beryl stones beryllium 4 zircon zirconium 40

Some elements were named after figures in mythology.

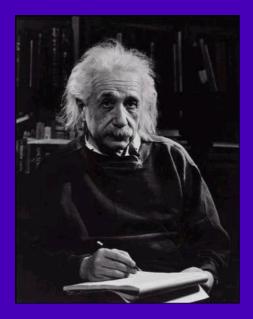


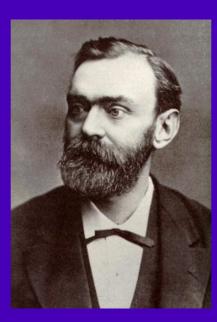


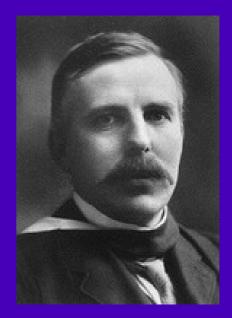
Thor	Prometheus	Pluto
thorium	promethium	plutonium
90	61	94

*notice that names of elements are not capitalized, even if they come from names that are

Some elements were named after scientists.







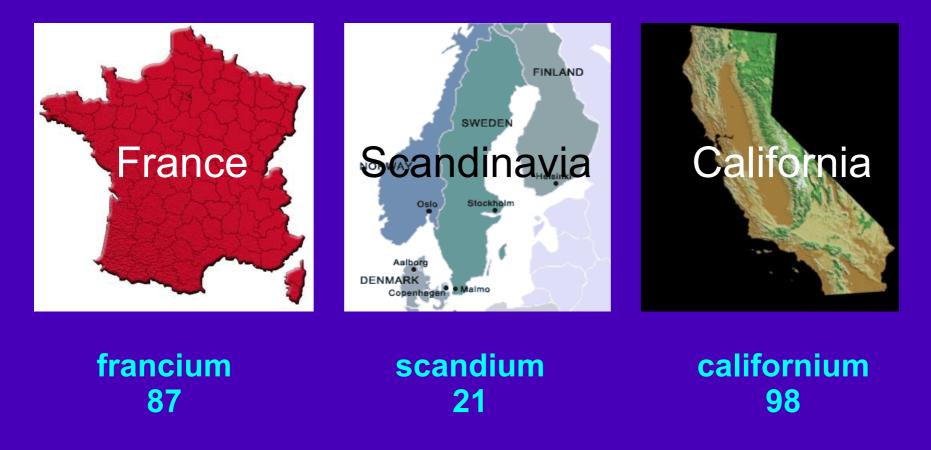
Albert Einstein

Alfred Nobel

Ernest Rutherford

einsteinium 99 nobelium 102 rutherfordium 104

Some were named after the home of their discoverer or the place where they were discovered (or made).



5. What are the symbols that we use for the elements?

It's a little inconvenient to have to write out the names for the elements all the time.

ELE	MENTS
🔿 Hydragen. 🎢	G Strontian
Azote 5	Barytes 6
Carbon In	I Iron 🦉
O Oxygen 7	2 Zinc 56
Phesphorus g	C Copper 56
G Sulphur 18	L Lead go
() Magnesia 20	S Silver 190
\varTheta Lime 24	Gold 190
D Soda 28	Platina 190
Potash A2	Mercury 167

Dalton invented a set of symbols. Why don't we use these? it would be hard to come up with 118 of them no symbols on a keyboard Today we use letters.

Some elements have only one capital letter.

sulfur	S
nitrogen	Ν
hydrogen	н

Some elements have a capital letter and a lower case letter.

calcium	Ca
magnesium	Mg
helium	Не

Some elements have symbols that don't seem to match their names because the symbols come from Latin:

mercury	Hg (from <i>hydrargyrum</i>)
silver	Ag (from <i>argentum</i>)
sodium	Na (from <i>natrium</i>)
others:	antimony (Sb), copper (Cu), gold (Au), iron (Fe), lead (Pb), potassium (K), tin (Sn), tungsten (W)

6. Which are the most common elements?

Known universe:



hydrogen 91% helium 8.75% all other elements 0.25%

Earth (crust, ocean, atmosphere):



oxygen 49.2% silicon 25.7% aluminum 7.50% iron 4.71% calcium 3.39% sodium 2.63% potassium 2.40% magnesium 1.93% hydrogen 0.87% titanium 0.58% chlorine 0.19% phosphorus 0.11% manganese 0.09 % carbon 0.08% sulfur 0.06% **barium 0.04%** nitrogen 0.03% fluorine 0.03% all others 0.49%

the human body



oxygen 65.0% carbon 18.0% hydrogen 10.0% nitrogen 3.0%

calcium 1.4 % phosphorus 1.0% magnesium 0.50% potassium 0.34% sulfur 0.26% sodium 0.14% chlorine 0.14% iron 0.004% 7. What do the elements look like in their pure form?

Of the 118 known elements, 21 have been found or made in such small amounts that we can't be sure what they look like.

Two examples:

astatine (85)

- rarest naturally occurring element
- formed by radioactive decay of uranium or actinium
- longest half-life 56 seconds
- less than one teaspoon on the earth

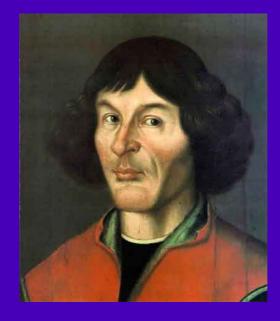




copernicium (112):

- most recently named artificial element
- a single atom was made in 1996 by smashing zinc and lead atoms together at a lab in Germany
- one more in 2000, two more in 2004
- named for Nicholas Copernicus on 19 February 2010, the 537th anniversary of his birth



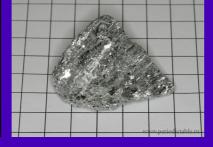


That leaves 97 whose appearance we can talk about here.

There are two main divisions: metals and nonmetals

Which of the following elements are which? How can you tell?





antimony



bromine



cadmium



chromium

aluminum



carbon



copper

fluorine

hafnium



lead



oxygen



mercury



phosphorus



sulfur

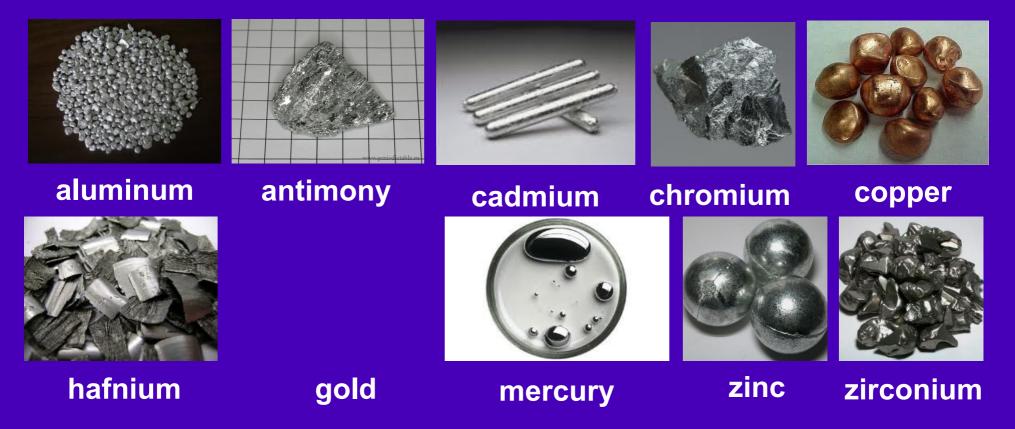


zinc



zirconium

First we'll look at the metals: 74 elements



appearance: most metals are grayish-white shiny solids

exceptions: gold is bright yellow, copper is orange-red color mercury is the only liquid

characteristics: shiny, conduct heat and electricity, dent or bend when hammered, opaque even when very thin

What about the nonmetals? 17 elements



hydrogen, helium, nitrogen, oxygen, neon, argon, krypton, radon, xenon are colorless; fluorine is yellow, chlorine is yellow-green liquids: 1 element bromine crystalline solids: 5 elements phosphorus, sulfur, carbon, iodine, selenium

There are also some elements that are sort of in between metals and nonmetals – we call them metalloids.



boron



germanium



arsenic



antimony tellurium

characteristics: solid, gray, sort of metallic looking, but shatter when hammered and are semiconductors

Knowing whether an element is a metal, nonmetal, or metalloid in its pure form will help us predict how it will form compounds!

Some elements have more than one form that they can be in when pure.



found at the surface of the earth

graphite



formed at high temperature and pressure about 100 miles underground, carried up by very deep volcanos

diamond

phosphorus:

white phosphorus



ignites spontaneously in air used as a weapon of war

red phosphorus



doesn't ignite until it reaches 464° F; used in matches

When elements in their pure state have more than one physical form, these are called allotopes.

Can you find any of the elements in their pure form in nature? not very often – most are only found in compounds or mixtures with other elements

Calcium is commonly found as a compound of calcium, carbon, and oxygen called calcium carbonate. You can find it in limestone, pearls, seashells, and dietary supplements.





Calcium in its pure form is not found naturally; it can be obtained by electrolysis of calcium compounds. It is a metal, and reacts with air.

Elements that can be found in pure form in nature are sometimes called "native" elements.





gold nugget

native silver





native copper native platinum









iron meteorite native graphite rough diamond native sulfur