UC Leuven Limburg
MOVING MINDS

De website www.chemieleerkracht.be

Gebruik van cartoons-memes chemische bindingen

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Co-valent
Developing talents creates chemistry!

Indeling

- Cartoons elementen op chemieleerkracht LINK
- Cartoons chemische bindingen op chemieleerkracht LINK
- Compoundchem LINK

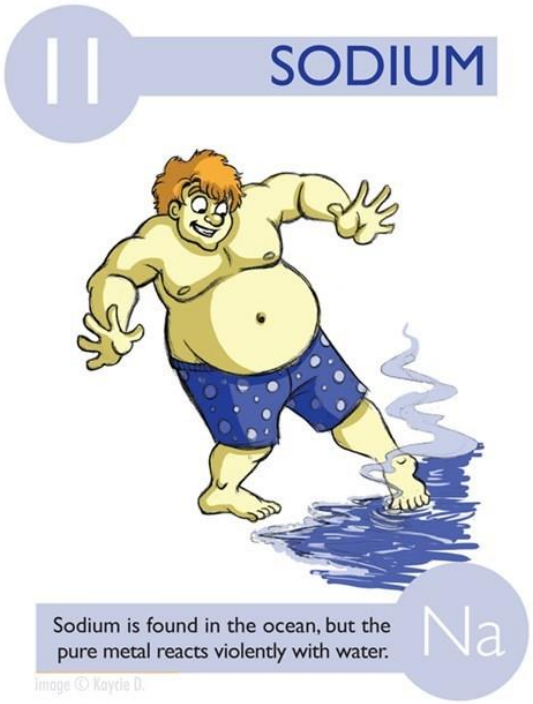
Mogelijkheden

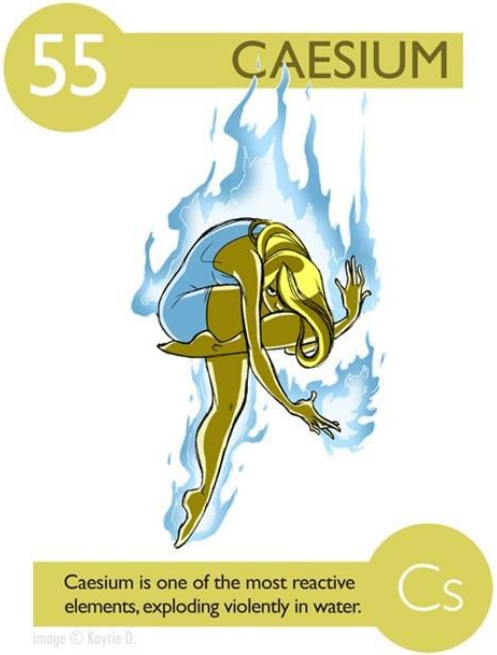
- 1, Intro van een nieuw thema
- 2, Vergelijking tussen een aantal begrippen
  - Al dan niet ontdekken laten van verschillen
- 3. Trends
- 4, Illustreren bij begrip
- 5, Verfraaien van de cursus (weinig inhoudelijke meerwaarde)

--inductieve aanbreng begrip

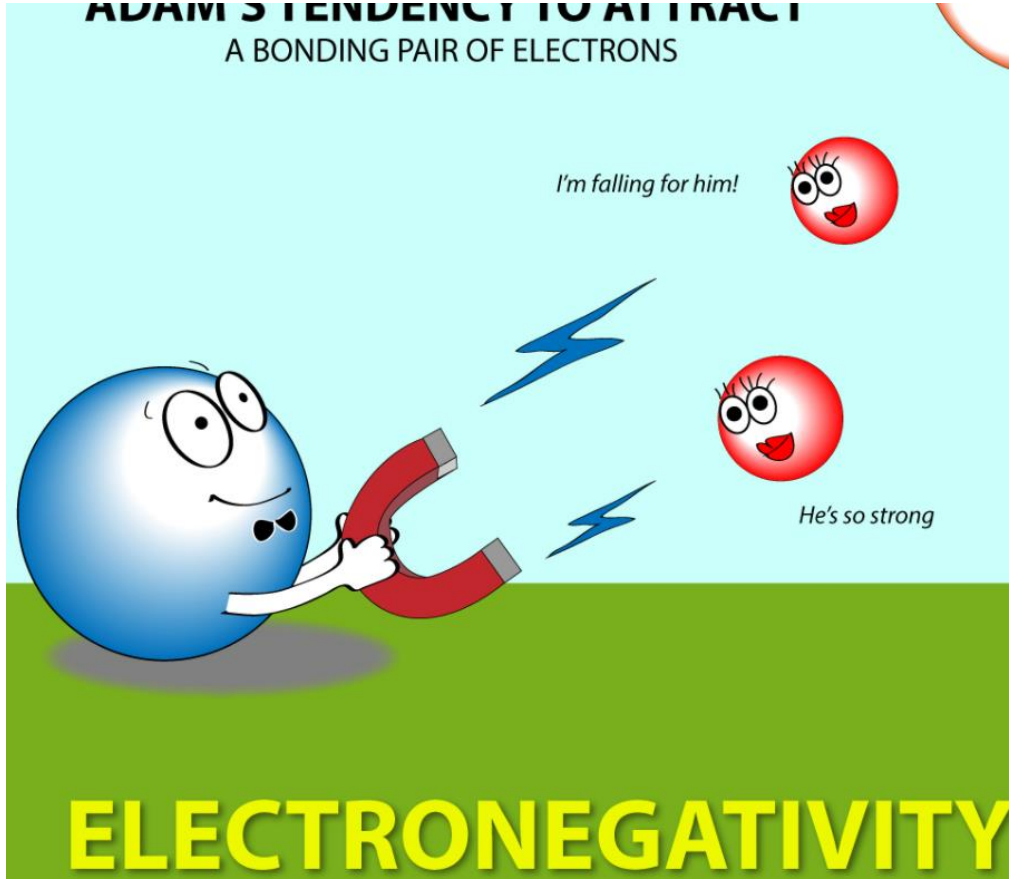
Elementen

Verschil in eigenschappen zichtbaar bij elementen

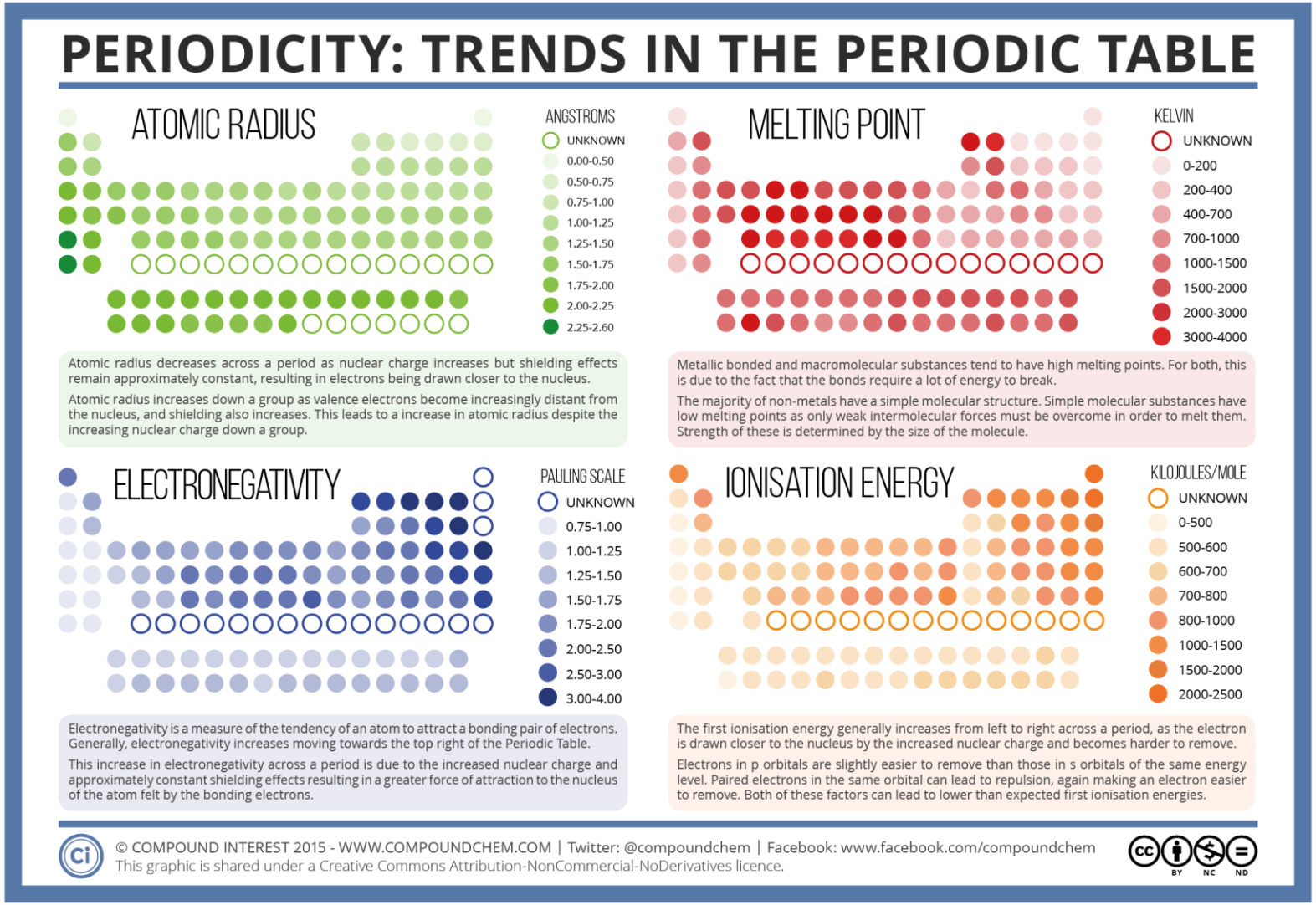




Elektronegativiteit



Trends


PERIODICITY: TRENDS IN THE PERIODIC TABLE
ATOMIC RADIUS
ANGSTROMS
UNKNOWN
0.00-0.50
0.50-0.75
0.75-1.00
1.00-1.25
1.25-1.50
1.50-1.75
1.75-2.00
2.00-2.25
2.25-2.60
Atomic radius decreases across a period as nuclear charge increases but shielding effects remain approximately constant, resulting in electrons being drawn closer to the nucleus.
Atomic radius increases down a group as valence electrons become increasingly distant from the nucleus, and shielding also increases. This leads to a increase in atomic radius despite the increasing nuclear charge down a group.
MELTING POINT
KELVIN
UNKNOWN
0-200
200-400
400-700
700-1000
1000-1500
1500-2000
2000-3000
3000-4000
Metallic bonded and macromolecular substances tend to have high melting points. For both, this is due to the fact that the bonds require a lot of energy to break.
The majority of non-metals have a simple molecular structure. Simple molecular substances have low melting points as only weak intermolecular forces must be overcome in order to melt them. Strength of these is determined by the size of the molecule.
ELECTRONEGATIVITY
PAULING SCALE
UNKNOWN
0.75-1.00
1.00-1.25
1.25-1.50
1.50-1.75
1.75-2.00
2.00-2.50
2.50-3.00
3.00-4.00
Electronegativity is a measure of the tendency of an atom to attract a bonding pair of electrons. Generally, electronegativity increases moving towards the top right of the Periodic Table.
This increase in electronegativity across a period is due to the increased nuclear charge and approximately constant shielding effects resulting in a greater force of attraction to the nucleus of the atom felt by the bonding electrons.
IONISATION ENERGY
KILOJOULES/MOLE
UNKNOWN
0-500
500-600
600-700
700-800
800-1000
1000-1500
1500-2000
2000-2500
The first ionisation energy generally increases from left to right across a period, as the electron is drawn closer to the nucleus by the increased nuclear charge and becomes harder to remove.
Electrons in p orbitals are slightly easier to remove than those in s orbitals of the same energy level. Paired electrons in the same orbital can lead to repulsion, again making an electron easier to remove. Both of these factors can lead to lower than expected first ionisation energies.
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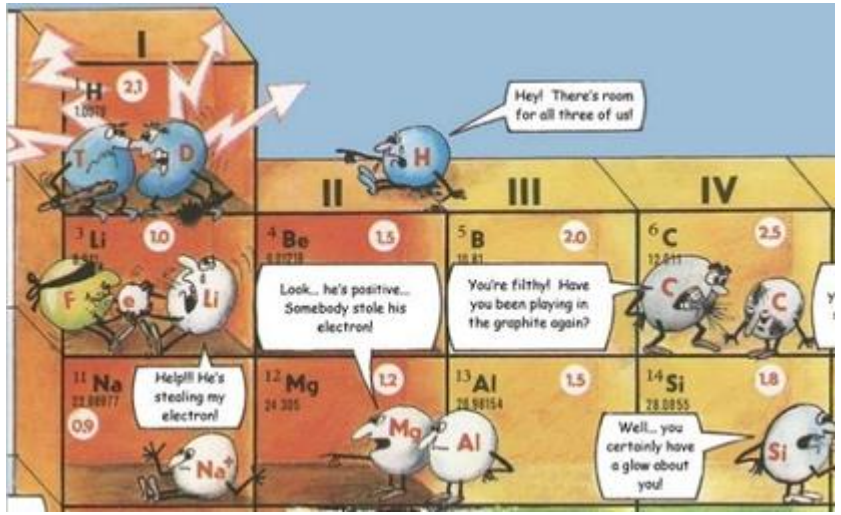
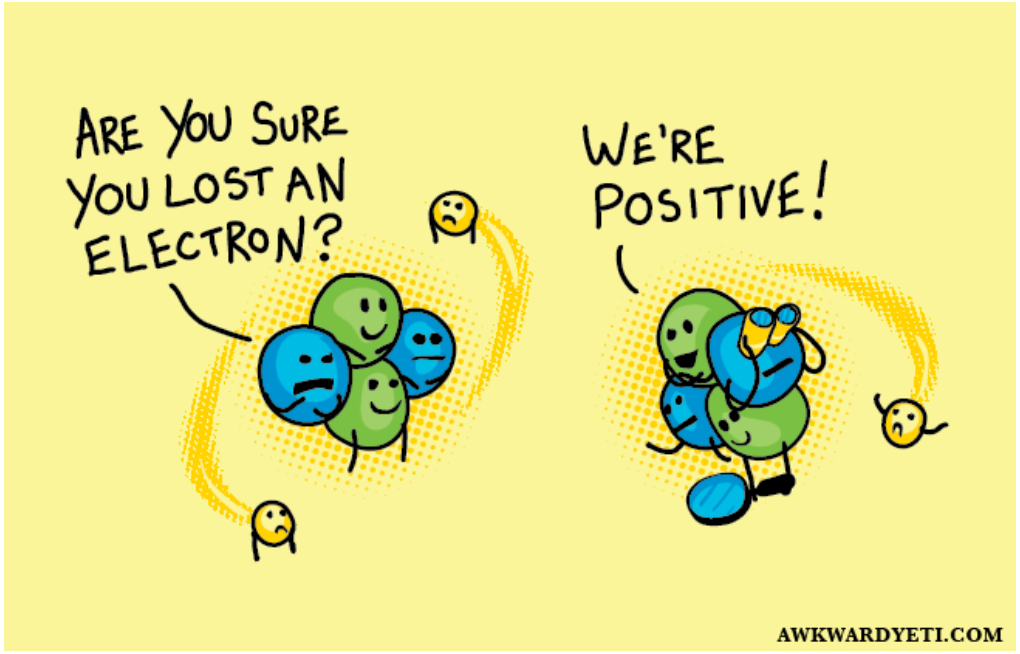
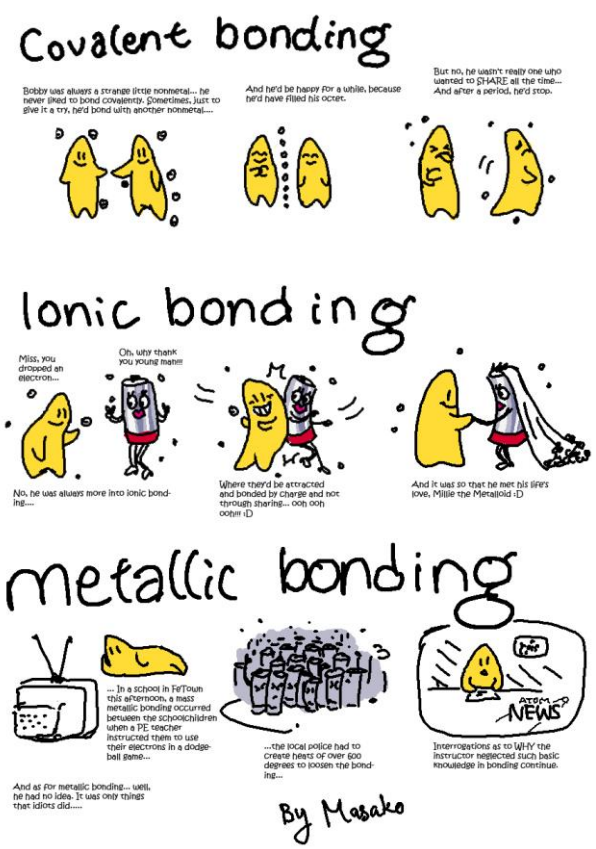
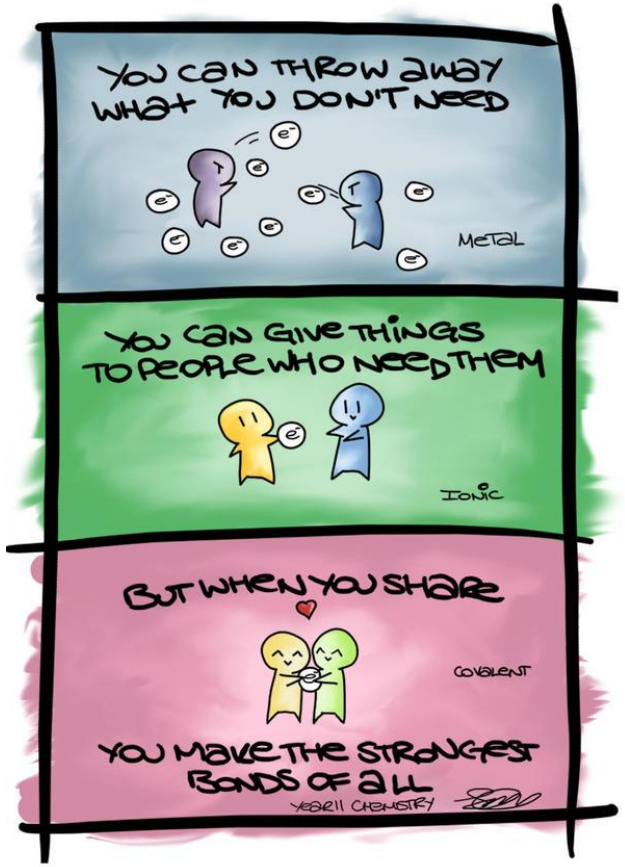
Anion - kation

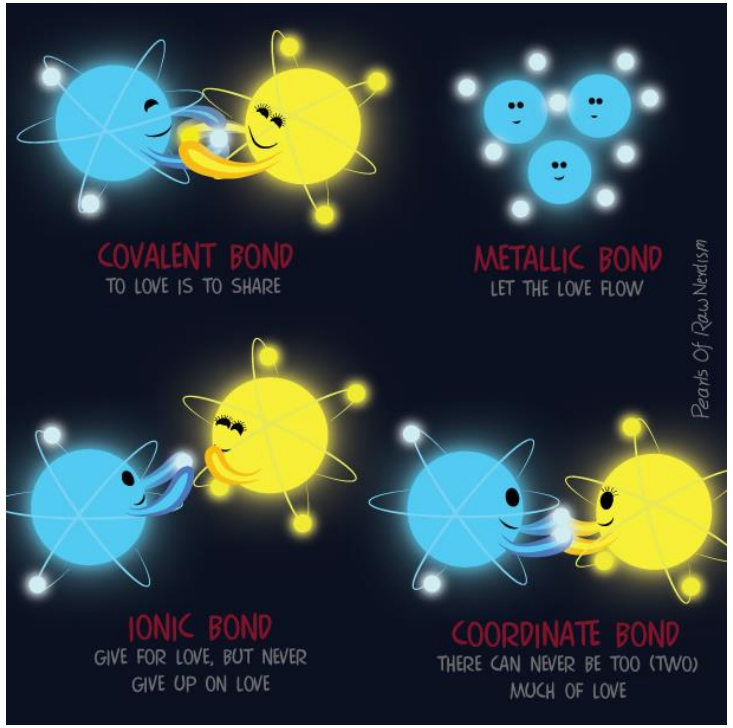




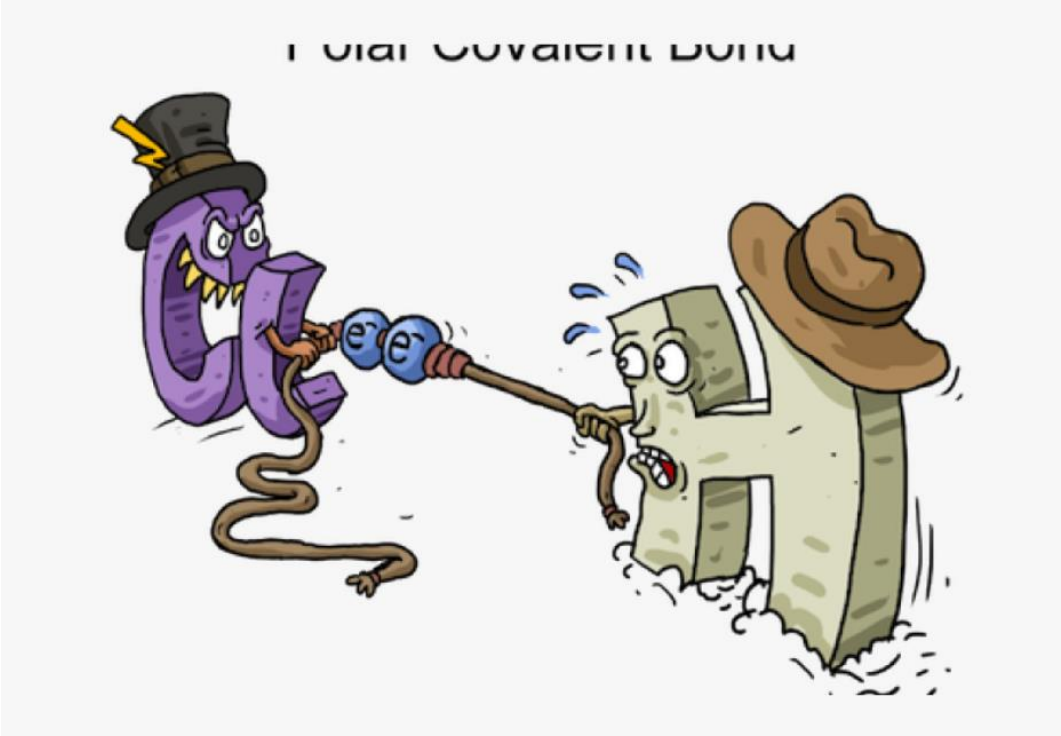
Soorten bindingen

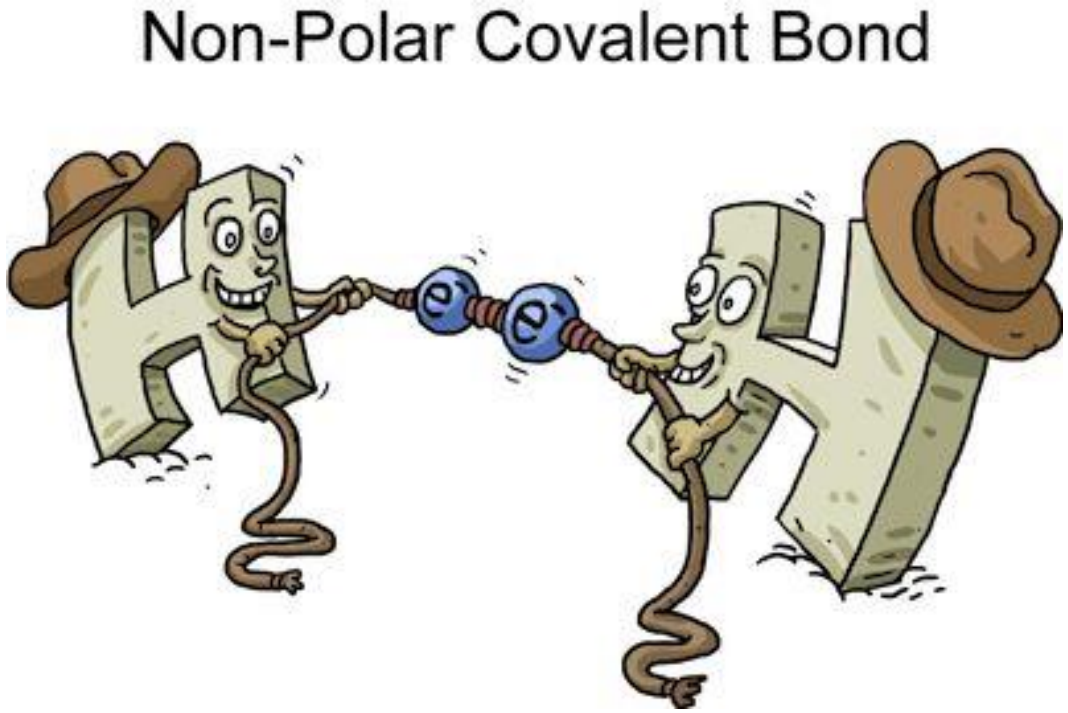






Polaire en niet-polaire atoombinding

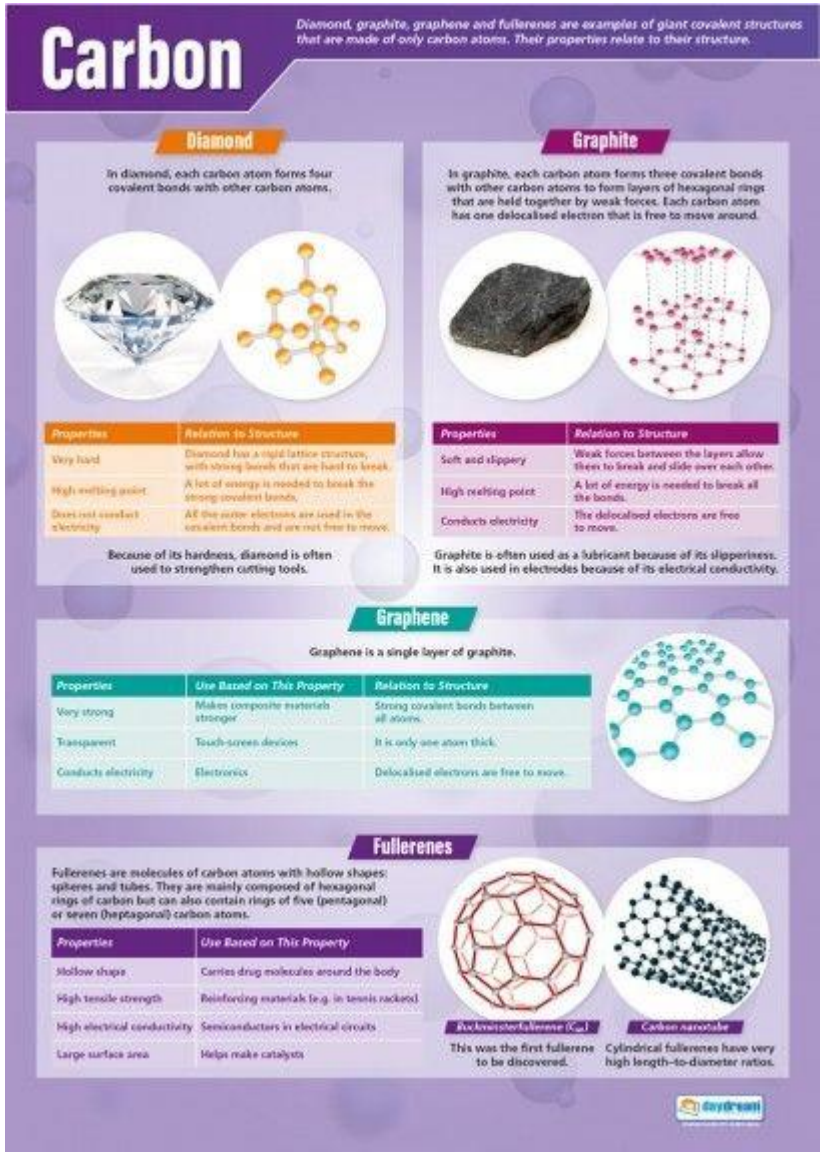




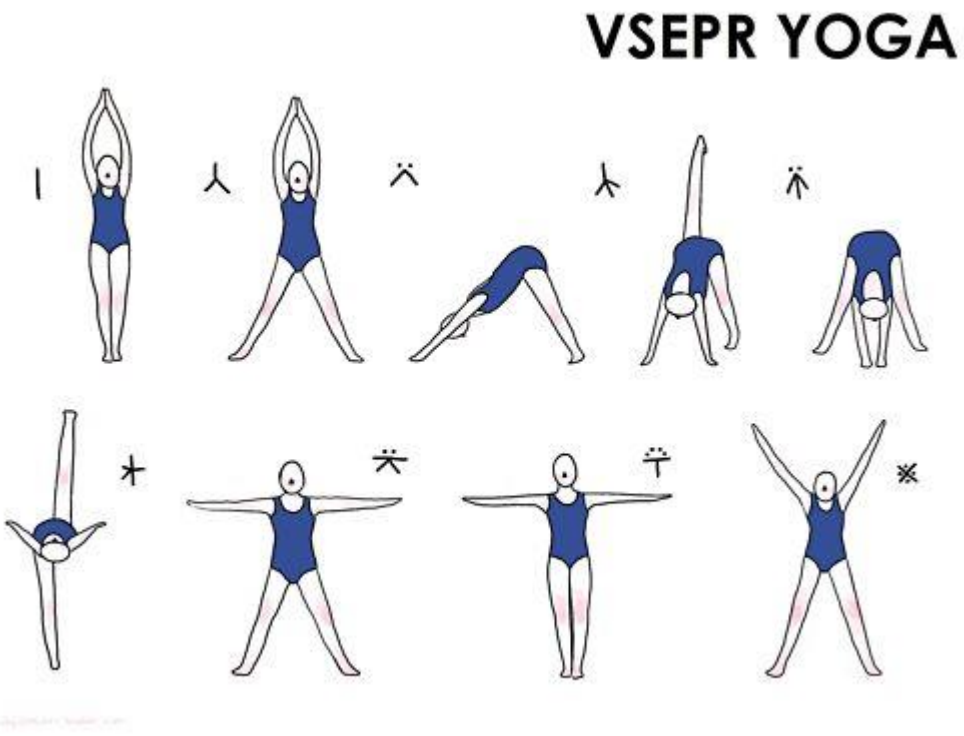
Koolstof

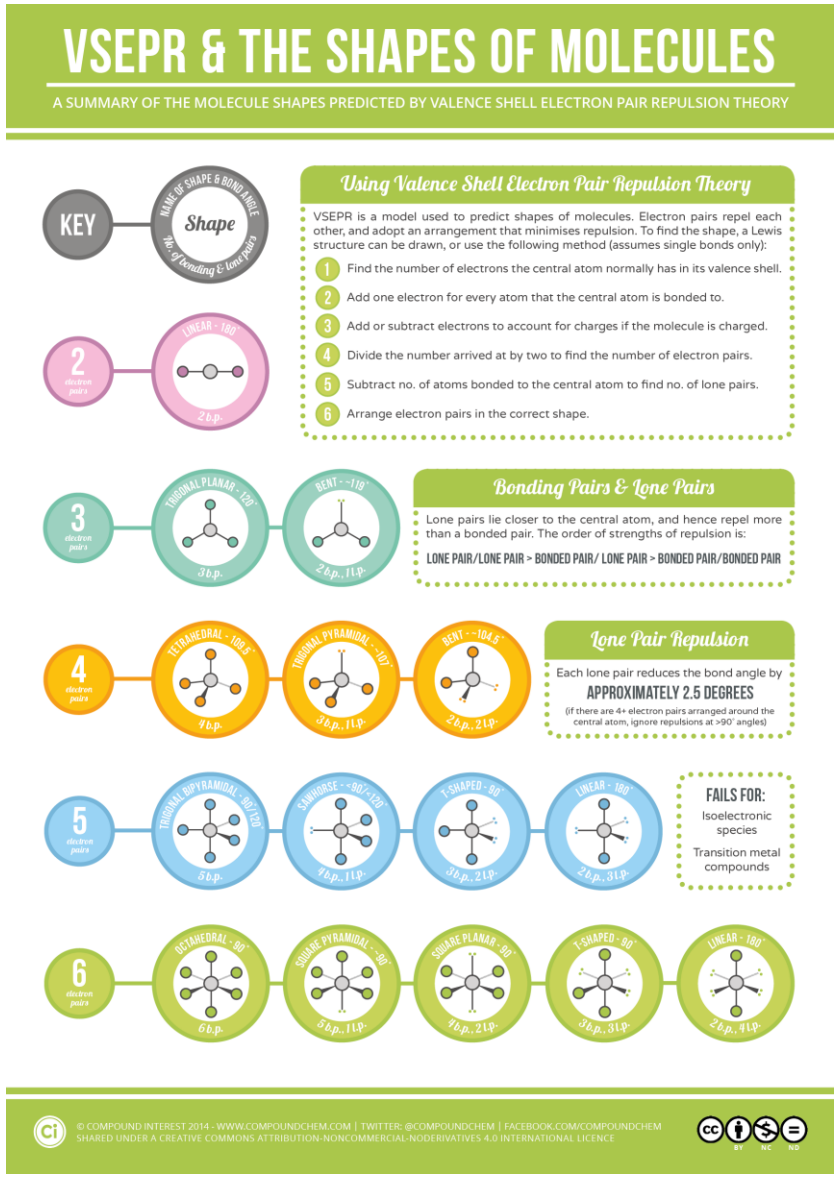

6
CARBON
Carbon can take the forms of charcoal, graphite, and diamond.
C
image © Kaycie D.


THE HUMAN TOUCH OF CHEMISTRY
Leave me alone! I've been under a lot of pressure lately!


Carbon
Diamond, graphite, graphene and fullerenes are examples of giant covalent structures that are made of only carbon atoms. Their properties relate to their structure.
Diamond
In diamond, each carbon atom forms four covalent bonds with other carbon atoms.
Properties
Relation to Structure
Very hard
Diamond has a rigid lattice structure, with strong bonds that are hard to break
High melting point
A lot of energy is needed to break the strong covalent bonds.
Does not conduct electricity
All the outer electrons are used in the covalent bonds and are not free to move.
Because of its hardness, diamond is often used to strengthen cutting tools.
Graphite
In graphite, each carbon atom forms three covalent bonds with other carbon atoms to form layers of hexagonal rings that are held together by weak forces. Each carbon atom has one delocalised electron that is free to move around.
Properties
Relation to Structure
Soft and slippery
Weak forces between the layers allow them to break and slide over each other.
High melting point
A lot of energy is needed to break all the bonds.
Conducts electricity
The delocalised electrons are free to move.
Graphite is often used as a lubricant because of its slipperiness. It is also used in electrodes because of its electrical conductivity.
Graphene
Graphene is a single layer of graphite.
Properties
Use Based on This Property
Relation to Structure
Very strong
Makes composite materials stronger
Strong covalent bonds between all atoms.
Transparent
Touch-screen devices
It is only one atom thick.
Conducts electricity
Electronics
Delocalised electrons are free to move.
Fullerenes
Fullerenes are molecules of carbon atoms with hollow shapes: spheres and tubes. They are mainly composed of hexagonal rings of carbon but can also contain rings of five (pentagonal) or seven (heptagonal) carbon atoms.
Properties
Use Based on This Property
Hollow shape
Carries drug molecules around the body
High tensile strength
Reinforcing material (e.g. in tennis rackets)
High electrical conductivity
Semiconductors in electrical circuits
Large surface area
Helps make catalysts
Buckminsterfullerene (C60)
This was the first fullerene to be discovered.
Carbon nanotube
Cylindrical fullerenes have very high length-to-diameter ratios.
daydream

VSEPR


VSEPR YOGA


VSEPR & THE SHAPES OF MOLECULES
A SUMMARY OF THE MOLECULE SHAPES PREDICTED BY VALENCE SHELL ELECTRON PAIR REPULSION THEORY
KEY
Shape
Using Valence Shell Electron Pair Repulsion Theory
VSEPR is a model used to predict shapes of molecules. Electron pairs repel each other, and adopt an arrangement that minimises repulsion. To find the shape, a Lewis structure can be drawn, or use the following method (assumes single bonds only):
1 Find the number of electrons the central atom normally has in its valence shell.
2 Add one electron for every atom that the central atom is bonded to.
3 Add or subtract electrons to account for charges if the molecule is charged.
4 Divide the number arrived at by two to find the number of electron pairs.
5 Subtract no. of atoms bonded to the central atom to find no. of lone pairs.
6 Arrange electron pairs in the correct shape.
Bonding Pairs & Lone Pairs
Lone pairs lie closer to the central atom, and hence repel more than a bonded pair. The order of strengths of repulsion is:
LONE PAIR/LONE PAIR > BONDED PAIR/ LONE PAIR > BONDED PAIR/BONDED PAIR
Lone Pair Repulsion
Each lone pair reduces the bond angle by
APPROXIMATELY 2.5 DEGREES
(if there are 4+ electron pairs arranged around the central atom, ignore repulsions at >90° angles)
FAILS FOR:
Isoelectronic species
Transition metal compounds
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