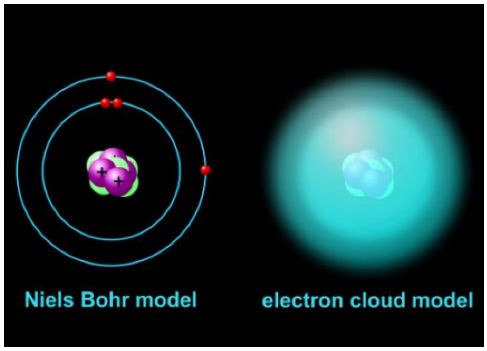
Fascinating Education Script

Chemistry Lessons - Review

Chemistry Review - Lesson 1 - The Structure of the Atom

Slide 1: Lesson 1 Review

Slide 2: Lesson 1 - Question 1

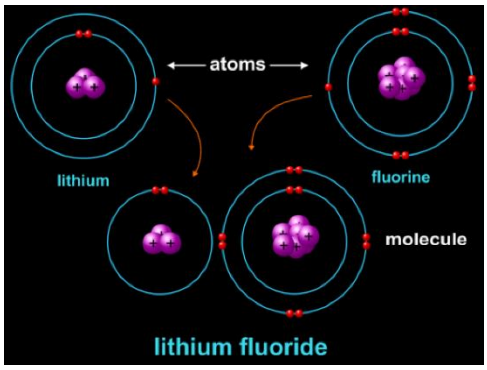


What is the difference between the Niels Bohr model and the electron cloud model of an atom?

The Niels Bohr model shows electrons revolving around the nucleus in rings while the electron cloud model describes the electrons surrounding the nucleus in various shaped clouds.

The cloud model is closer to the truth, but the Bohr model is easier to understand.

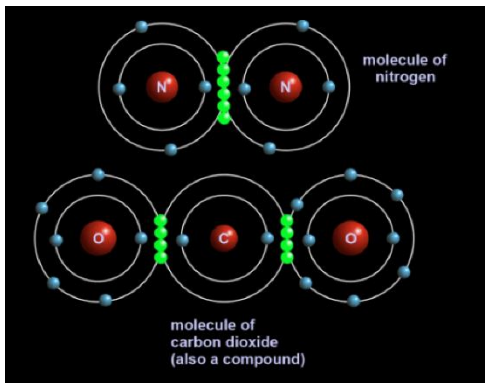
Slide 3: Lesson 1 - Question 2



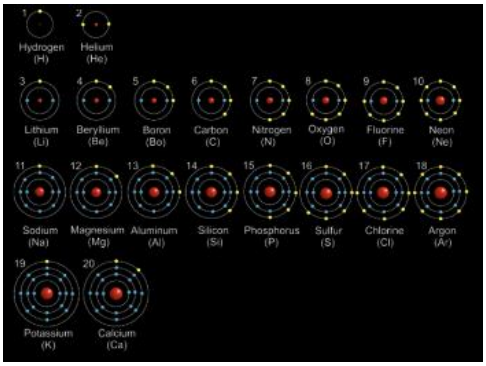
What is the difference between an atom and a molecule?

An atom is made up of a nucleus surrounded by electrons. A molecule is composed of two or more atoms bonded together.

A sample of helium, neon, or argon gas is made up of single atoms, not molecules. A compound is a molecule containing two different types of atoms, so N_2, nitrogen, is a molecule while the molecule carbon dioxide, CO_2, is not only a molecule, but also a compound.



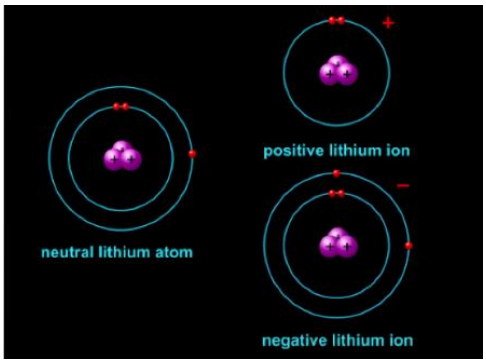
Slide 4: Lesson 1 - Question 3



What is the difference between an atom and an element?

The periodic table is divided into over 100 elements. Each element is made up solely of atoms of that element, so the element lithium contains only lithium atoms. "Which atom" in the periodic table and "which element" in the periodic table refer to the same thing even though they have slightly different definitions.

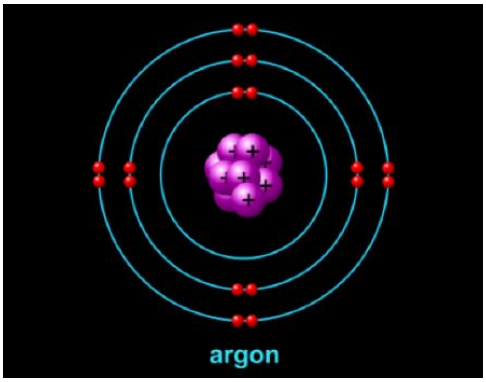
Slide 5: Lesson 1 - Question 4



Is an ion an atom?

Yes, an ion is an atom. An ion is an atom that either has fewer electrons than protons -- a positive ion, or an atom that has more electrons than protons -- a negative ion.

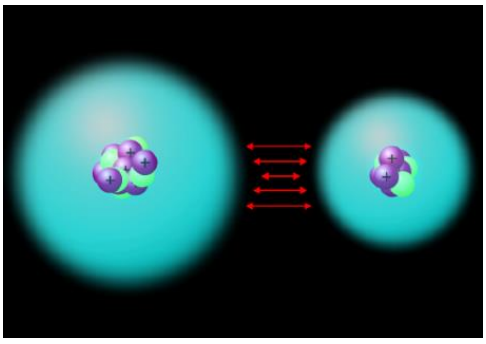
Slide 6: Lesson 1 - Question 5



How many electrons fill up Ring 1, Ring 2, and Ring 3?

Two electrons fill up Ring 1, but eight electrons fill up Rings 2 and 3.

Slide 7: Lesson 1 - Question 6

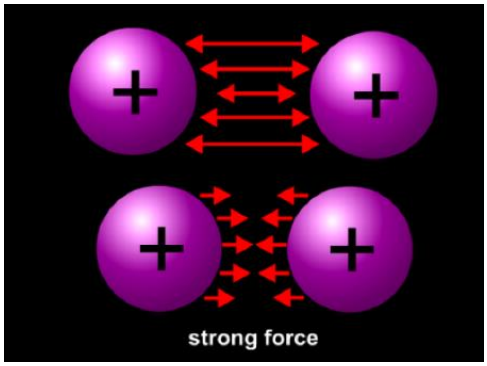


If molecules approach each other slowly, they don't actually touch each other. Why not?

Because the electron cloud around every nucleus repels the electron cloud around every other nucleus, enough that the two atoms' mutual repulsion prevents them from touching each other. However, if the atoms approach each other with enough energy, they can overcome their mutual repulsion.

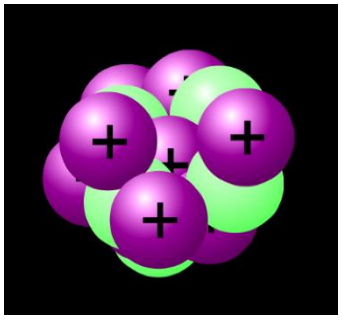
With enough energy, two colliding atoms can even form an intramolecular bond and become a molecule.

Slide 8: Lesson 1 - Question 7



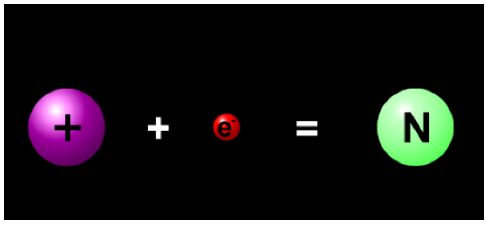
How are positively charged protons in the nucleus able to overcome their mutual repulsion and remain so close together?

The nucleus uses both the strong force and neutrons to keep protons together in the nucleus. When two protons get extremely close to each other, their electrical repulsion becomes extremely strong, but that's when the strong force kicks in. The strong force is stronger than the electrical repulsion between protons and is able to pull the two protons together very tightly.



Neutrons work by nudging in between protons and separating them slightly. This reduces the electrical repulsion between protons. Using neutrons to nudge protons apart slightly does not weaken the strong force trying to hold the two protons together, because neutrons have their own strong force.

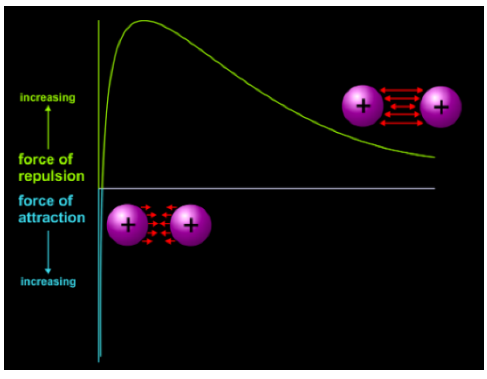
Slide 9: Lesson 1 - Question 8



How is it that neutrons have their own strong force?

Because every proton has a strong force and neutrons are made by combining a proton with an electron to make an electrically neutral neutron.

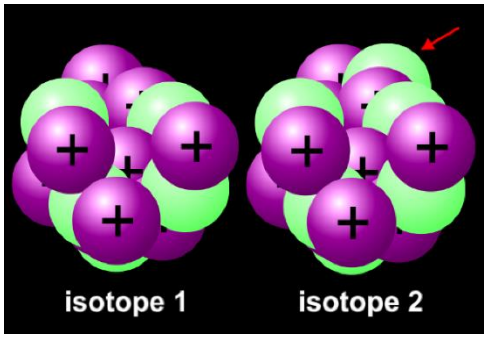
Slide 10: Lesson 1 - Question 9



If you were to graph out the force of repulsion between two protons as they approach each other in a nucleus, what would the graph look like?

The graph would show the force of repulsion increasing rapidly as the two protons approach each other. As the two protons get extremely close to each other, the graph would show the force of repulsion beginning to lessen and then rapidly flipping around and becoming a force of attraction instead of a force of repulsion.

Slide 11: Lesson 1 - Question 10



What are isotopes?

Isotopes are atoms of the same element with different numbers of neutrons in the nucleus. Because the atoms have the same number of protons in the nucleus, all the atoms are of the same element even though they have different numbers of neutrons. The only difference between isotopes is their slight weight difference. Chemically, they act the same as every other atom of that element.

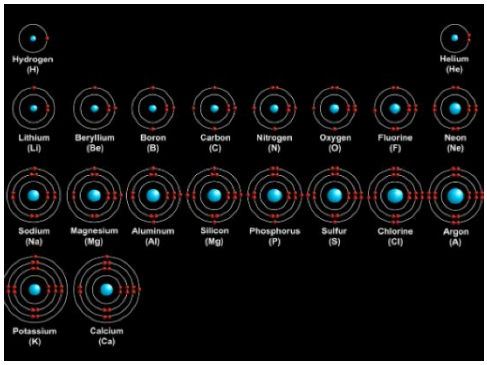
Slide 12: Lesson 1 - Question 11

The Law of Entropy prevents energy from accumulating in one specific area. What is so wrong about letting energy accumulate in one specific area?

Allowing energy to accumulate in one specific area is too unstable.

The Law of Entropy stabilizes the universe by leveling things out, so water runs downhill, hot things cool off, and atoms and molecules bond with each other, all to get rid of extra energy.

Slide 13: Lesson 1 - Question 12



Of the first twenty elements in the periodic table, which three don't need to bond to another atom to fill their outer shell?

Helium, neon, and argon -- the inert elements.

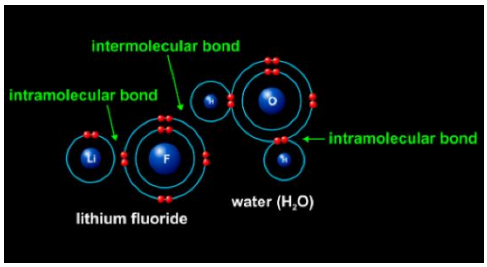
Slide 14: Lesson 1 - Question 13

What is the difference between an intramolecular bond and an intermolecular bond?

An intramolecular bond holds atoms together.

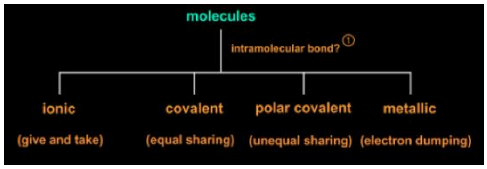
An intermolecular bond holds molecules together.

Intramolecular bonds are much stronger than intermolecular bonds, but both intramolecular and intermolecular bonds depend on positive being attracted to negative, and vice-versa, negative being attracted to positive.



Slide 15: Lesson 1 - Question 14

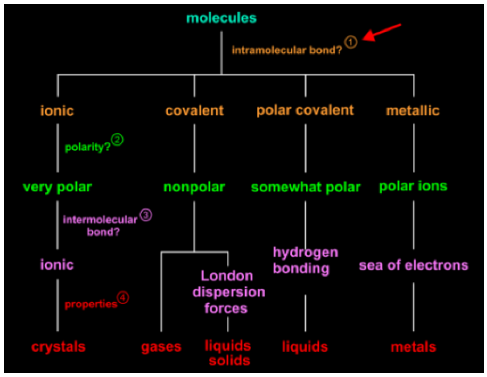
What are the four ways atoms bond together with intramolecular bonds?



Give-and-take ionic bonds, equal-sharing covalent bonds, unequal-sharing polar covalent bonds, and electron-dumping metallic bonds.

Slide 16: Lesson 1 - Question 15

What do intramolecular bonds predict?



Each intramolecular bond between two atoms predicts how polar the molecule will be, which then determines the intermolecular bond between molecules, and the intermolecular bond determines the properties of the molecule – whether it will form a gas, liquid, or solid, whether it will be soluble in water, how well it conducts electricity and heat, and so on.