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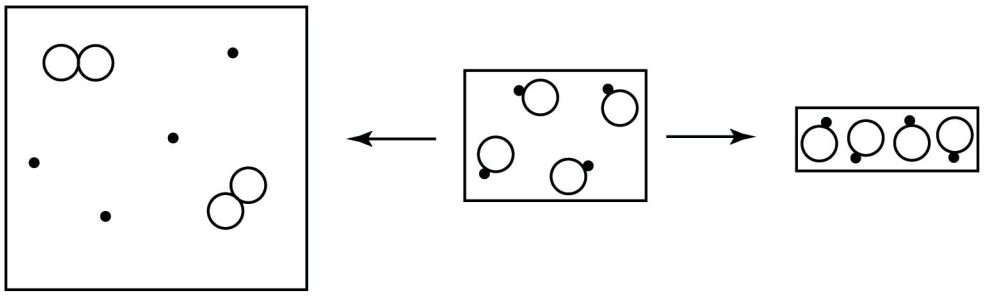
Conceptual Biology

Chapter 2: The Chemistry of Life

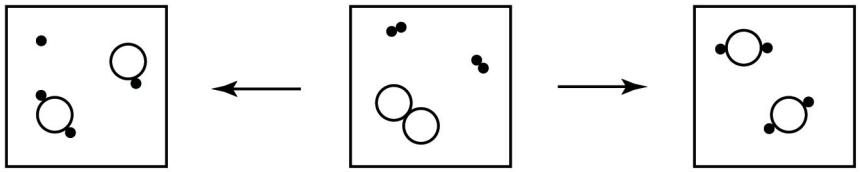
The Submicroscopic

Each circle or dot represents an atom.



A B C

1. How many molecules are shown in A _____ B _____ C _____
2. How many atoms are shown in A _____ B _____ C _____
3. Which represents a physical change? B → A B → C (circle one)
4. Which represents a chemical change? B → A B → C (circle one)
5. Which box(es) represent(s) a mixture? A _____ B _____ C _____
6. Which box contains the most mass? A _____ B _____ C _____
7. Which box contains the most air between molecules? A _____ B _____ C _____



A B C

8. How many molecules are shown in A _____ B _____ C _____
9. How many atoms are shown in A _____ B _____ C _____
10. Which represents a physical change? B → A B → C (circle one)
11. Which represents a chemical change? B → A B → C (circle one)
12. Which box(es) represent(s) a mixture? A _____ B _____ C _____
13. Which box contains the most mass? A _____ B _____ C _____

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Chapter 2:The Chemistry of Life

Subatomic Particles

Three fundamental particles of the atom are the _____, _____, and _____ . At the center of each atom lies the atomic _____, which consists of _____ and _____. The **atomic number** refers to the number of _____ in the nucleus. All atoms of the same element have the same number of _____, hence, the same atomic number.

Isotopes are atoms that have the same number of _____ but a different number of _____. An isotope is identified by its **atomic mass number**, which is the total number of _____ and _____ in the nucleus. A carbon isotope that has 6 _____ and 6 _____ is identified as carbon-12, where 12 is the atomic mass number. A carbon isotope having 6 _____and 8 _____, on the other hand, is carbon-14.

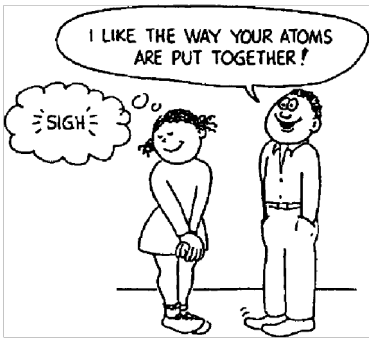
1. Complete the following table:

Isotope	Number of... Electrons	Protons	Neutrons
Hydrogen-1	1		
Chlorine-36		17	
Nitrogen-14			7
Potassium-40	19		
Arsenic-75		33	
Gold-197			118

2. Which results in a more valuable product — *adding* or *substracting* protons from gold nuclei?

3. Which has more mass, a helium atom or a neon atom?

4. Which has a greater number of atoms, a gram of helium or a gram of neon?



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Chapter 2: The Chemistry of Life
Types of Chemical Bonds

1. Based upon their positions in the periodic table, predict whether each pair of elements will form an ionic, covalent, or metallic bond (See also Section 18.3 of the textbook)
   a. Gold (79) and Platinum (78) _____ b. Rubidium (37) and Iodine (53) _____
   c. Sulfur (16) and Chlorine (17) _____ d. Sulfur (16) and Magnesium (12) _____
   e. Calcium (20) and Chlorine (17) _____ f. Germanium(32) and Arsenic (33) _____
   g. Iron (26) and Chromium (24) _____ h. Chlorine (17) and Iodine (53) _____
   i. Carbon (6) and Bromine (35) _____ j. Barium (56) and Astatine (85) _____

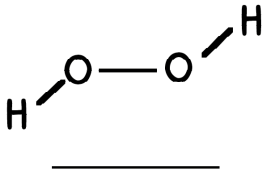
2. The most common ions of lithium, magnesium, aluminum, chlorine, oxygen, and nitrogen and their respective charges are as follows:

Positively Charged Ions	Negatively Charged Ions
Lithium ion: Li^{1+}	Chloride ion: Cl^{1-}
Barium ion: Ba^{2+}	Oxide ion: O^{2-}
Aluminum ion: Al^{3+}	Nitride ion: N^{3-}

Use this information to predict the chemical formulas for the following ionic compounds:
   a. Lithium Chloride:_____ b. Barium Chloride: _____ c. Aluminum Chloride: _____
   d. Lithium Oxide:_____ e. Barium Oxide: _____ f. Aluminum Oxide: _____
   g. Lithium Nitride:_____ h. Barium Nitride: _____ i. Aluminum Nitride: _____

   j. How are elements that form positive ions grouped in the periodic table relative to elements that form negative ions?_____

3. Predict whether the following chemical structures are polar or nonpolar:



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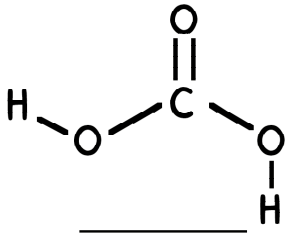

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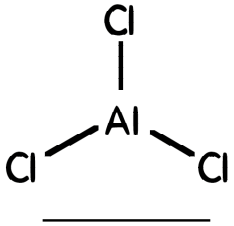

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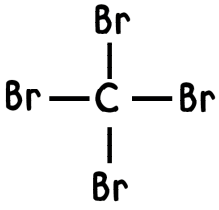

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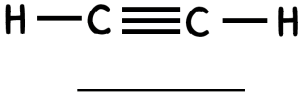

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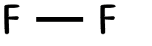

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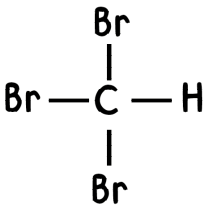

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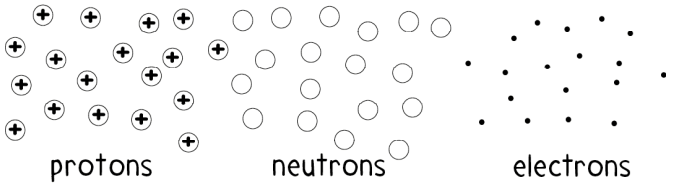
Conceptual Biology

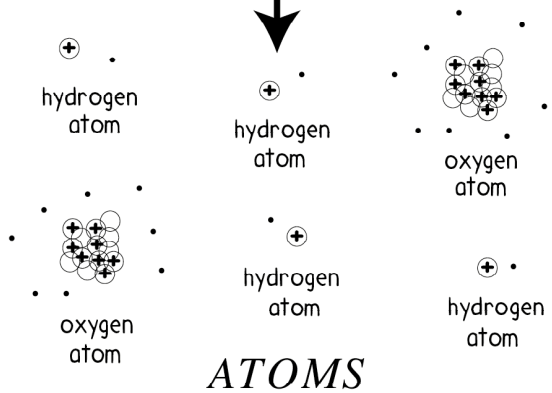
Chapter 2: The Chemistry of Life

Atoms to Molecules to Molecular Attractions



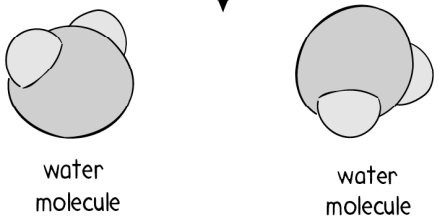
Subatomic particles are the fundamental building blocks of all _____.

SUBATOMIC PARTICLES



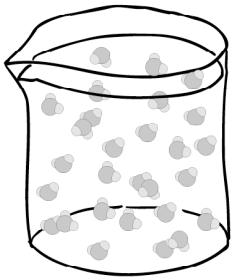
An atom is a group of _____ held tightly together. An oxygen atom is a group of 8 _____, 8 _____, and 8 _____. A hydrogen atom is a group of only 1 _____ and 1 _____.

ATOMS



A _____ is a group of atoms held tightly together. A water _____ consists of 2 _____ atoms and 1 _____ atom.

MOLECULES



Water is a material made up of billions upon billions of water _____. Water's physical properties are based upon how these water _____ interact with one another.

WATER

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Conceptual Biology

Chapter 2: The Chemistry of Life
Solutions

1. Use these terms to complete the following sentences. Some terms may be used more than once.

solution	solvent	solute
dissolve	concentrated	dilute
saturated	concentration	mole
molarity	solubility	soluble
insoluble	precipitate	supersaturated

Sugar is _____ in water, for the two can be mixed homogeneously to form a _____. The _____ of sugar in water is so great that _____ homogeneous mixtures are easily prepared. Sugar, however, is not infinitely _____ in water, for when too much of this _____ is added to water, which behaves as the _____, the solution becomes _____. At this point any additional sugar is _____ for it will not _____. If the temperature of a saturated sugar solution is lowered, the _____ of the sugar in water is also lowered. If some of the sugar comes out of solution, it is said to form a _____. If, however, the sugar remains in solution despite the decrease in solubility, then the solution is said to be _____. Adding only a small amount of sugar to water results in a _____ solution. The _____ of this solution or any solution can be measured in terms of _____, which tells us the number of solute molecules per liter of solution. If there are 6.022×10^{23} molecules in 1 liter of solution, then the _____ of the solution is 1 _____ per liter.

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