

HW 1 – Chemical Transformations

Note: Please do as many problems as you can, you do not have to answer all the questions.

- In **chemical transformations** (called chemical reactions) substances change into different substances. In **physical transformations** substances do not change into new ones
- Substances are made of **atoms**. Atoms get together to form **molecules**
- **Molecules** are building blocks of substances controlling their properties
- The most **basic unit of each element is an atom**, we cannot break the element any further and still call it this element
- **Element** - Contains just one type of atoms
- **Compound** - Is a chemical substance, which molecules are made of atoms from more than one element
- **A mixture** - contains two or more different substances that are not joined together – pure substances can be separated from mixtures. An example of a mixture is air, which contains nitrogen (N₂), oxygen (O₂), argon (Ar), water (H₂O), ozone (O₃), and torpeniol (this is a molecule released by conifers, C₁₀H₁₈O).

1. Imagine you turn a) stone into sand, b) oxygen to ozone, c) ice to vapor – in what case do you do a chemical transformation (chemical reaction)? What happens when we burn a candle – physical or chemical transformation?
2. Find two mixtures in the following list: a) oxygen, b) ozone, c) river water, d) water in the clouds, e) kitchen salt, f) air, g) sugar.
3. Which one of the following expressions does not make sense: a) molecule of torpeniol, b) molecule of air, c) molecule of ozone, d) molecule of water?
4. Which one in the following list is a compound: a) carbon dioxide solution in water, b) carbon dioxide, c) oxygen, d) nitrogen, e) ozone
5. A molecule of aspirin is composed of 9 atoms of carbon (“C”), 8 atoms of hydrogen (“H”) and 4 atoms of oxygen (“O”). Its chemical formula can be written as C₉H₈O₄.
 - a. Aspirin burns in oxygen forming carbon dioxide (CO₂) and water (H₂O). If you imagine splitting a molecule of aspirin into atoms and adding oxygen atoms to it how many molecules of water and carbon dioxide can be obtained from a molecule of aspirin?
 - b. How many oxygen molecules (O₂) will be necessary to turn one molecule of aspirin into carbon dioxide and water?