What is Green Chemistry?

Green chemistry is the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.

The 12 Principles of Green Chemistry:

1. **Prevention**
   It is better to prevent waste than to treat or clean up waste after it has been created.
2. **Atom Economy**
   Synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.
3. **Less Hazardous Chemical Syntheses**
   Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.
4. **Designing Safer Chemicals**
   Chemical products should be designed to effect their desired function while minimizing their toxicity.
5. **Safer Solvents and Auxiliaries**
   The use of auxiliary substances (e.g., solvents, separation agents, etc.) should be made unnecessary wherever possible and innocuous when used.
6. **Design for Energy Efficiency**
   Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure.
7. **Use of Renewable Feedstocks**
   A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.
8. **Reduce Derivatives**
   Unnecessary derivatization (use of blocking groups, protection/deprotection, temporary modification of physical/chemical processes) should be minimized or avoided if possible because such steps require additional reagents and can generate waste.
9. **Catalysis**
   Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.
10. **Design for Degradation**
    Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.
11. **Real-time Analysis for Pollution Prevention**
    Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.
12. **Inherently Safer Chemistry for Accident Prevention**
    Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.

Source: The Green Chemistry Institute
Website: http://www.chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=greenchemistryinstitute\index.html

Examples of Companies Embracing Green Chemistry

Nike (www.nike.com)

Nike has recently developed a new line of shoes called Nike Considered™. Nike has also recently removed PVC from its list of approved materials, reduced the use of petroleum-based adhesives, instituted a running-shoe recycling program, and developed "an environmentally preferred rubber that reduces toxics by 96% by weight."

Biota Spring Water (www.biotaspringwater.com)

From their website: "BIOTA uses nature-based packaging from NatureWorks™ PLA. NatureWorks™ PLA is the first commercially viable packaging material derived entirely from an annually renewable resource – corn. BIOTA is the first beverage company in the world to exclusively use NatureWorks™ PLA to bottle its products. BIOTA water bottles are completely compostable. They are approved and certified as commercially compostable by the Biodegradable Products Institute (BPI). Initial testing has demonstrated that a BIOTA water bottle will degrade within 75 to 80 days in a commercial composting situation. A traditional plastic bottle will never biodegrade."

Green Earth Office Supply (www.greenearthofficesupply.com)

Green Earth Office Supply maintains strict product standards that promote the ethics of sustainability. They "consider environmentally friendly products to be those which minimize the use of resources, create less pollution, and result in less harm to all living creatures." For example, they use plastic and paper products that are either recycled, recyclable, or entirely compostable. Their wood products come from sustainably harvested sources. And they carry nontoxic alternatives wherever possible for items like glue, markers, highlighters, or papers (e.g., using chlorine-free papers).