Twelve Principles of Green Chemistry*

The Green Lab program works to implement sustainable practices and technologies in lab buildings.

What can you do to "Green up" your lab?

*Adapted from Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice, Oxford University Press: New York, 1998, p.30. By permission of Oxford University Press from ACS.

1. **Prevention** - Prevent waste rather than treating or cleaning up after waste has been created.

2. **Atom Economy** – Design synthetic methods to maximize the incorporation of all materials used in the process into the final product.

3. **Less Hazardous Chemical Syntheses** - Generate substances that possess little or no toxicity to human health and the environment.

4. **Design Safer Chemicals** - Chemical products should be designed to affect 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. Need help finding alternatives? Check MIT's "Green" Alternatives Wizard at http://ehs.mit.edu/greenchem/

6. **Design for Energy Efficiency** – Use ambient temperature and pressure if possible.

7. **Use of Renewable Feedstocks** -Reagents should be renewable rather than depleting whenever technically and economically practical.

8. **Reduce Derivatives** – Avoid unnecessary derivatization (use of blocking groups, protection/ deprotection, temporary modification of physical/chemical processes), because such steps require additional reagents and can generate additional waste.

9. **Selective Catalysis** - is superior to stoichiometric reagents.

10. **Design for Degradation** - End products should break down into innocuous degradation products and do not persist in the environment.

11. **Real-time Analysis for Pollution Prevention** – Develop analytical methodologies 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.

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