GREEN CHEMISTRY

The principles cover such concepts as:

- the design of processes to maximize the amount of satrting material that ends up in the product;
- the use of renewable material feedstock's and energy sources;
- the use of safe, environmentally benign substances, including solvents, whenever possible;
- the design of energy efficient processes;
- avoiding the production of waste, which is viewed as the ideal form of waste management.

The twelve principles of green chemistry are:

1. **Prevention**. Preventing waste is better than treating or cleaning up waste after it is formed.
2. Atom economy. Synthetic methods should try to maximize the incorporation of all materials used in the process into the final product. This means that less waste will be generated as a result.
3. **Less hazardous chemical syntheses**. Synthetic methods should avoid using or generating substances toxic to humans and/or the environment.
4. **Designing safer chemicals**. Chemical products should be designed to achieve their desired function while being as non-toxic as possible.
5. **Safer solvents and auxiliaries**. Auxiliary substances should be avoided wherever possible, and as non-hazardous as possible when they must be used.
6. **Design for energy efficiency**. Energy requirements should be minimized, and processes should be conducted at ambient temperature and pressure whenever possible.
7. **Use of renewable feedstocks**. Whenever it is practical to do so, renewable feedstocks or raw materials are preferable to non-renewable ones.

8. **Reduce derivatives**. Unnecessary generation of derivatives—such as the use of protecting groups—should be minimized or avoided if possible; such steps require additional reagents and may generate additional waste.
9. **Catalysis**. Catalytic reagents that can be used in small quantities to repeat a reaction are superior to stoichiometric reagents (ones that are consumed in a reaction).
10. **Design for degradation**. Chemical products should be designed so that they do not pollute the environment; when their function is complete, they should break down into non-harmful products.
11. **Real-time analysis for pollution prevention**. Analytical methodologies need to be further developed to permit real-time, in-process monitoring and control *before* hazardous substances form.
12. **Inherently safer chemistry for accident prevention**. Whenever possible, the substances in a process, and the forms of those substances, should be chosen to minimize risks such as explosions, fires, and accidental releases.

PRINCIPLES OF GREEN CHEMISTRY : Green science is an exceedingly compelling way to deal with contamination aversion as it applies creative logical answers for certifiable natural circumstances. The accompanying 12 standards of Green Chemistry give an approach to scientific experts to execute green chemistry.

2.1 **Waste Control** : It is perfect to forestall squander than to take care of waste after it has been produced.

2.2 **Atom effectiveness** : Engineered planning must intended to enhance the all supplies utilized as element of procedure into product

2.3 **Application of non- destructive of reagents** : This incorporates the utilization of reagents and manufactured strategies that decreases the hazard and delivers eco-accommodating items that has no awful effect on human and atmosphere.

2.4 **Safer Chemicals Scheming** : Chemicals and reagents should accomplish their coveted ability while limiting their harmfulness.

2.5 Safer Solvents and Auxiliaries Broadly utilized solvents in unions are lethal and unstable – liquor, benzene (known cancer-causing), CCl_4, $CHCl_3$, perchloroethylene, CH_2Cl_2. These have now been supplanted by more secure green solvents.

2.6 **Design for Energy Efficiency** Vitality requirements of synthetic procedures must perceive for their ecological and monetary effects and should to be limited.

2.7 **Use of Renewable Feed stocks** : It is wanted to use crude materials and feedstock that are sustainable, however in fact and monetarily practicable. Referring to the case of sustainable feedstock which incorporate agrarian items and exhausting feedstock incorporate crude supplies that are extracted from non-renewable energy sources (oil, gaseous petrol or coal).

2.8 Shorter combinations Superfluous derivatization should be limited or managed a strategic space if possible and such strides require additional reagents and can produce squander. International Journal on Cybernetics & Informatics (IJCI) Vol. 6, No. 1/2, April 2017 129

2.9 **Use of Catalytic instead of Stoichiometric reagents** Impetuses are utilized as a part of little sums and can complete a solitary response commonly as are desirable over stoichiometric reagents, which are utilized as a part of overabundance and work. This will improve the selectivity, lessen the temperature of a change, diminish waste produced by reagent and conceivably keep away from undesirable side responses prompting a spotless innovation

2.10 **Design for dreadful conditions** Compound items ought to be planned so that toward the finish of their capacity they separate into harmless corruption items and don't hold on in nature.

2.**11Techniques to control pollution** Different techniques require developing for actual-time, in-process monitoring and control formation of hazardous substances.

2.12 **Use of Safer Chemicals and Process** Substances and the form of a substance used in a chemical process should be chosen so as to minimize the potential of chemical accidents, including releases, explosions, and fires.