M.SC Semester III

# Core Course XII

## Environmental Chemistry

## TOPIC:-Unit IV, GREEN SOLVENTS

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# TOPICS TO BE COVERED

- SOLVENT USAGE
- SOLVENTS EFFECTS & GREEN CHEMISTRY
- GREEN SOLVENTS & ITS DEFINITION
- ENVOIRMENTAL TOXOCOLOGY
- DETERMINATION OF TOXICITY
- SPECIFIC HEALTH & ENVOIRMENTAL REQUIREMENT
- GREEN SOLVENTS IN GREE CHEMISTRY
- PHYSICAL & CHEMICAL PROPERTIES OF SOLVENTS
- APPLICATION OF GREEN SOLVENTS

# SOLVENT USAGE :-

- Solvents are substances that are liquid during application and will dissolve other substances,

  which can be recovered unchanged on removal of the solvent.
- Research in green chemistry is making dramatic achievements in the design of chemicals, chemical syntheses, and chemical processes that are environmentally benign and economically feasible.
- The goal of green chemistry is to reduce the hazards associated with products and processes

- Widely used throughout the chemical industry
  - Synthetic Chemistry
    - Reaction medium on laboratory and industrial scale
    - Extensively used in work-up and purification (usually more than for reaction medium)
  - Analytical Chemistry
    - Sample extraction and preparation (Spectroscopy)
    - Chromatography mobile phase (HPLC, TLC etc.)
  - Crystallisation
    - Recrystallisation to purify compounds and prepare crystals suitable for analysis

- Used much more widely than just synthetic chemistry
- Coatings:
  - Paints, adhesives
    - Solvent usually removed by evaporation after application leaving coating behind
    - Coating removal
- Cleaning
  - E.g. Dry cleaning – extensive use of perchloroethylene, a known cancer suspect agent, which also contaminates groundwater supplies
- Extraction
  - E.g. Coffee decaffeination (benzene, $CH_2Cl_2$)

- Is the substance really needed?
- Could alternate, less toxic substitutes be used?
- What are the risks versus benefits for continued use of the agent?
- What is the environmental impact of the substance?
- Does the procurement of the agent deplete an environmental resource?
- Does existing technology permit the “final” disposal of the substance?
- If used, do we have the technology to ensure the “safe” use of the substance?

- Solvents as a Green Chemistry Tool :-

  Through a combination of knowledge of the nature of a chemical's hazardous properties with the ability to manipulate the chemical's structure, chemists possess the ability and skill to mitigate the hazard.

- Selection of Solvents and Reaction Conditions:-

  Selection of a solvent should be based not only on any hazards that the chemical may possess, but also on existing environmental problems that its use may exacerbate.