



# **SNS COLLEGE OF TECHNOLOGY**

Vazhiampalayam, Coimbatore-35

**(An Autonomous institution)**

Accredited by **NBA-AICTE** and Re-Accredited by **NAAC-UGC with A+ Grade**

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## **DEPARTMENT OF CHEMISTRY**

**COURSE NAME : 19CHB101- CHEMISTRY FOR ENGINEERS**

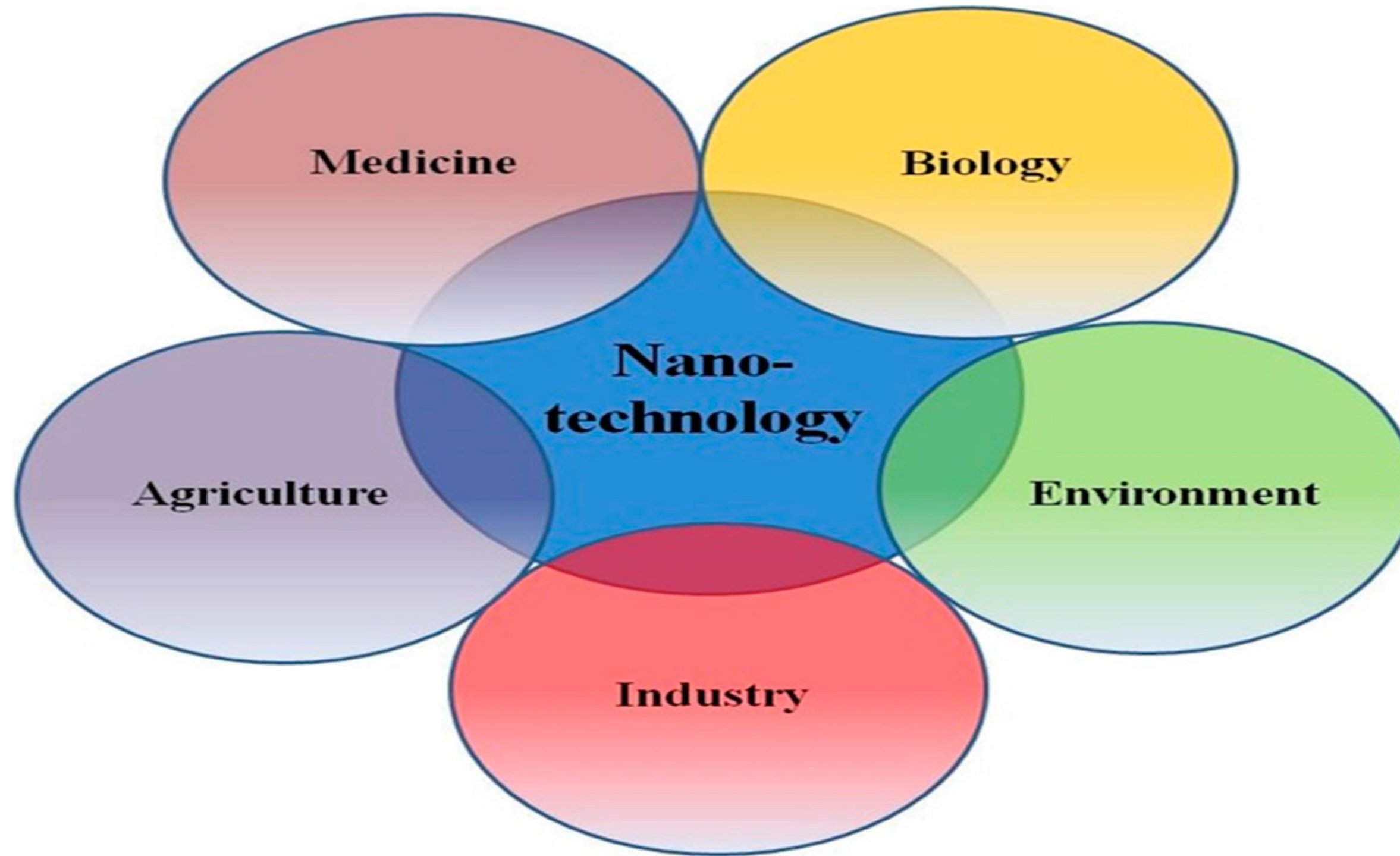
**I YEAR / I SEMESTER**

**UNIT : 2. NANOCHEMISTRY**

**TOPIC : 1. BASICS OF NANOTECHNOLOGY**



# WHY NANOTECHNOLOGY?

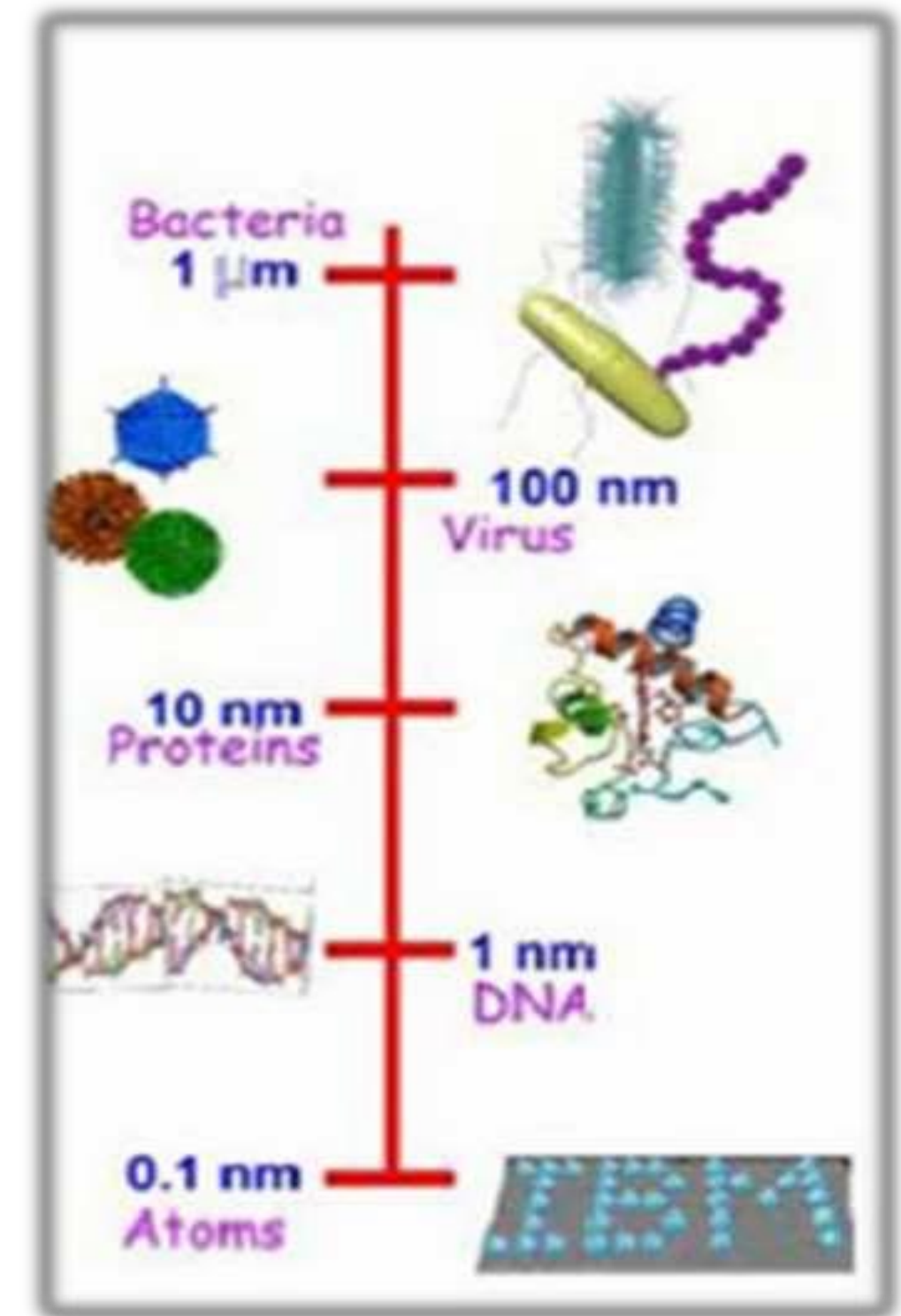




# NANOSCALE



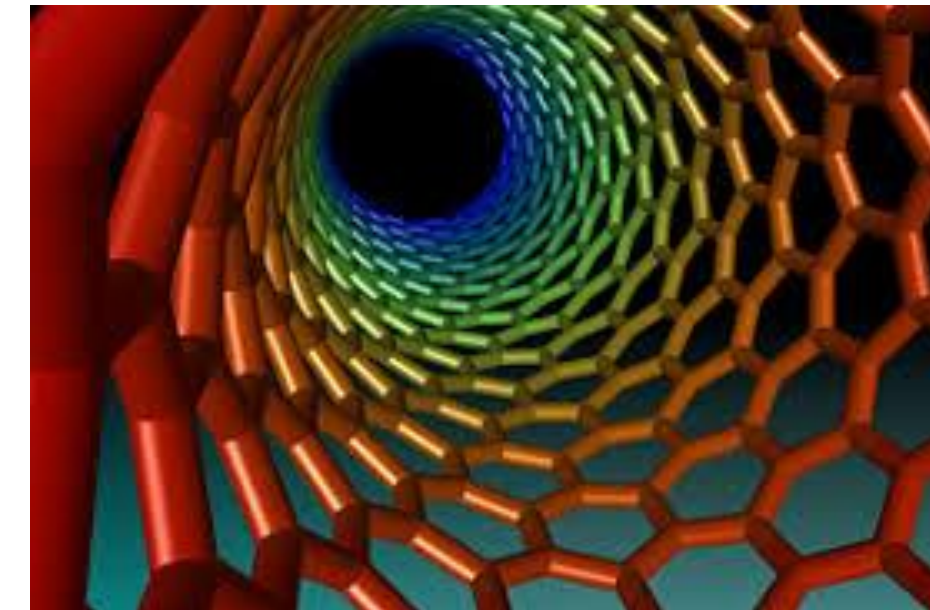
- Nano means dwarf (Greek word “nanos”).
- Richard Feynman (1959) laid foundation step of nanotechnology in his lecture on “**there is plenty of room at the bottom**”.
- The term was given by Nario Taniguchi and popularized by Drexler
- **Definition:** The manipulation of matter with at –least one dimension sized between **1 to 100 nanometers** (by National Nanotechnology Initiative)
- **A Nanometre** is a unit of length in the metric system, equal to one billionth of a metre ( $10^{-9}$ ).





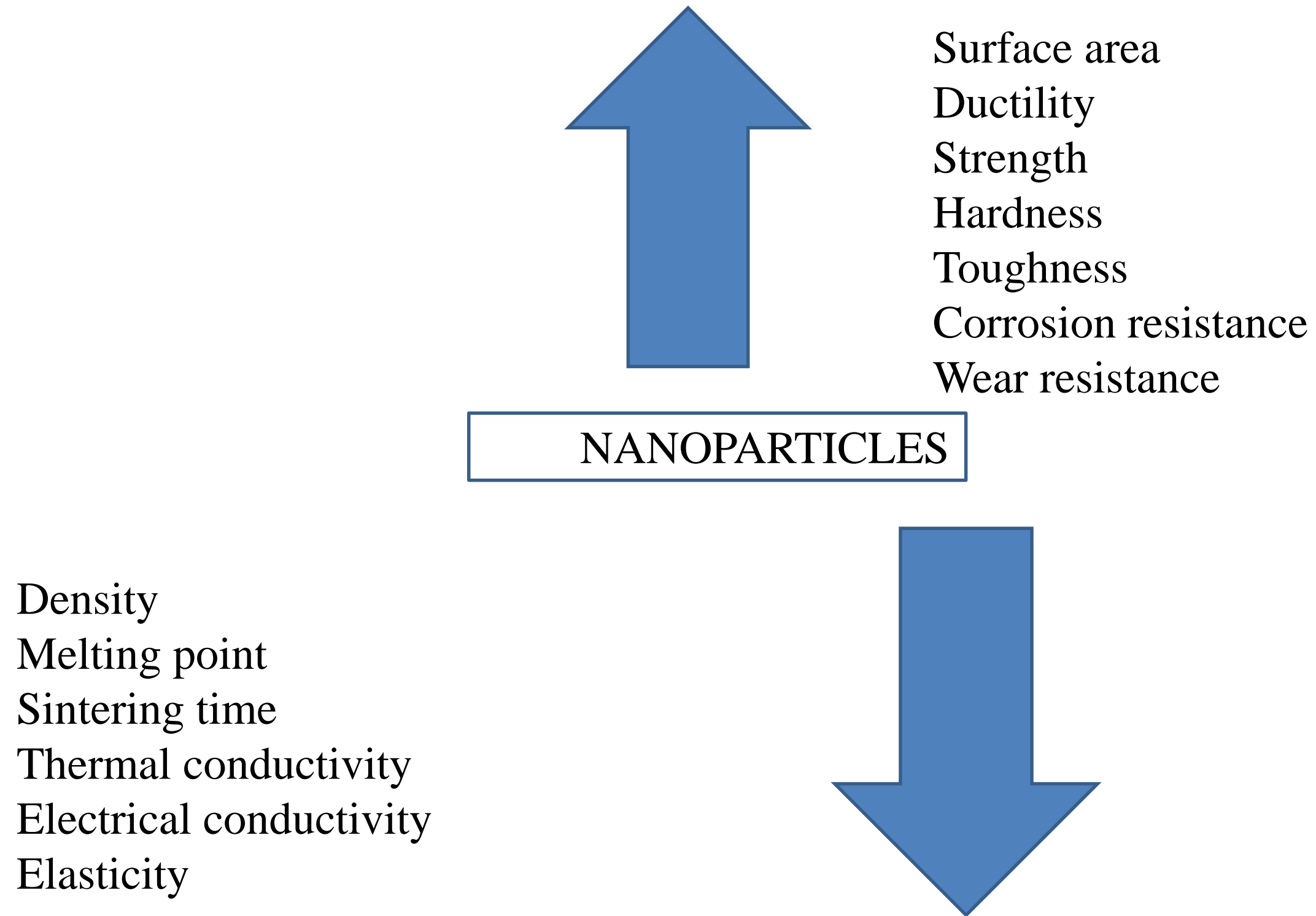
# NANOSCIENCE AND NANOTECHNOLOGY

- Nanoscience deals with the scientific study of objects with sizes in the **1 – 100 nm range** in at least one dimension.
- Nanotechnology is the creation of functional materials, devices, and systems through control of matter on the nanometer (1 to 100 nm) length scale and the exploitation of novel properties and phenomena developed at that scale.





# PROPERTIES OF NANOPARTICLES - BULK MOLECULES







# SYNTHESIS OF NANOPARTICLES

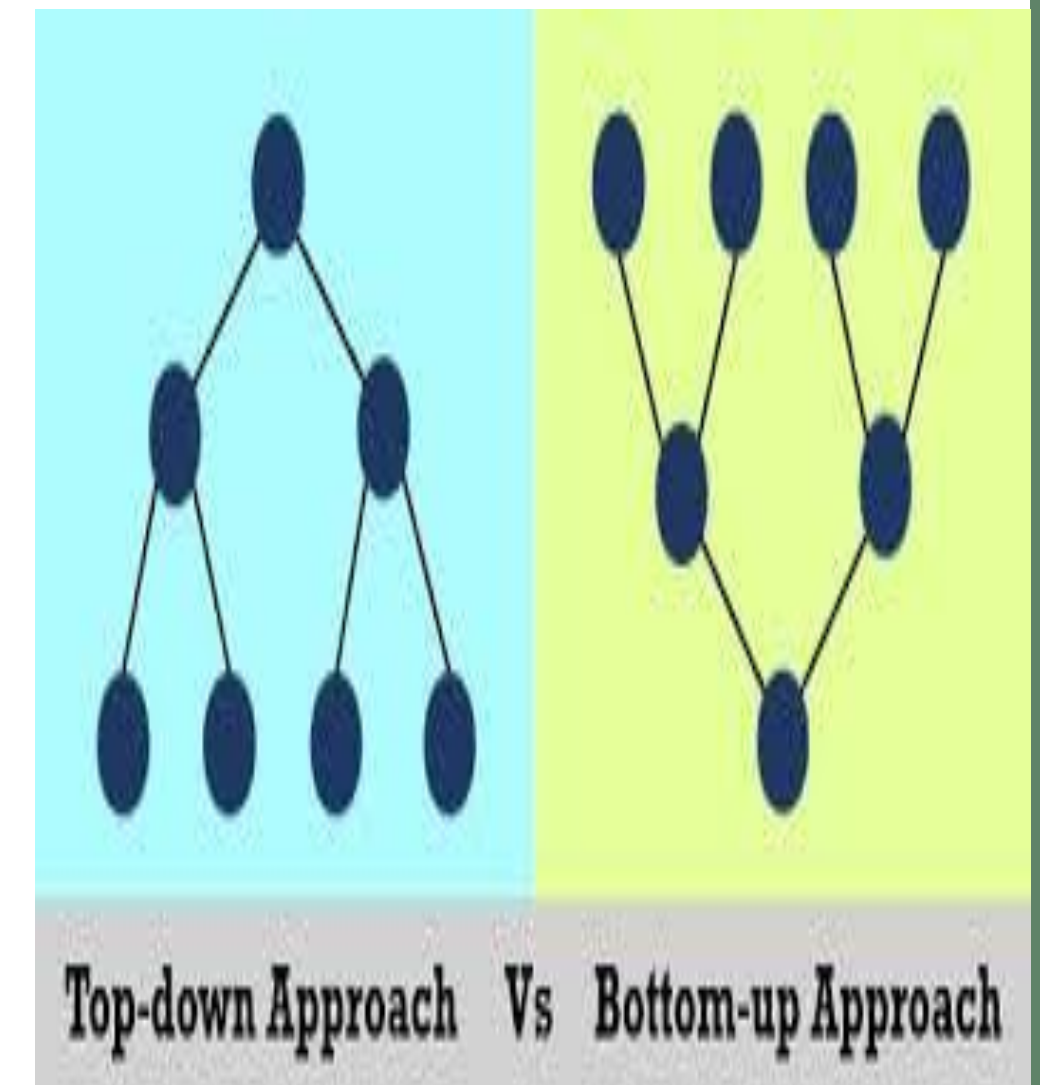


Two approaches:

- Bottom-up
- Top-down

## Bottom-up Approach

- In the bottom-up approach, molecular components arrange themselves into more complex assemblies atom-by-atom, molecule-by-molecule, cluster-by cluster from the bottom (e.g., growth of a crystal).
- Molecular components arrange themselves into some useful conformation using the concept of molecular self-assembly.
- For example, synthesis of nanoparticles by colloid dispersions

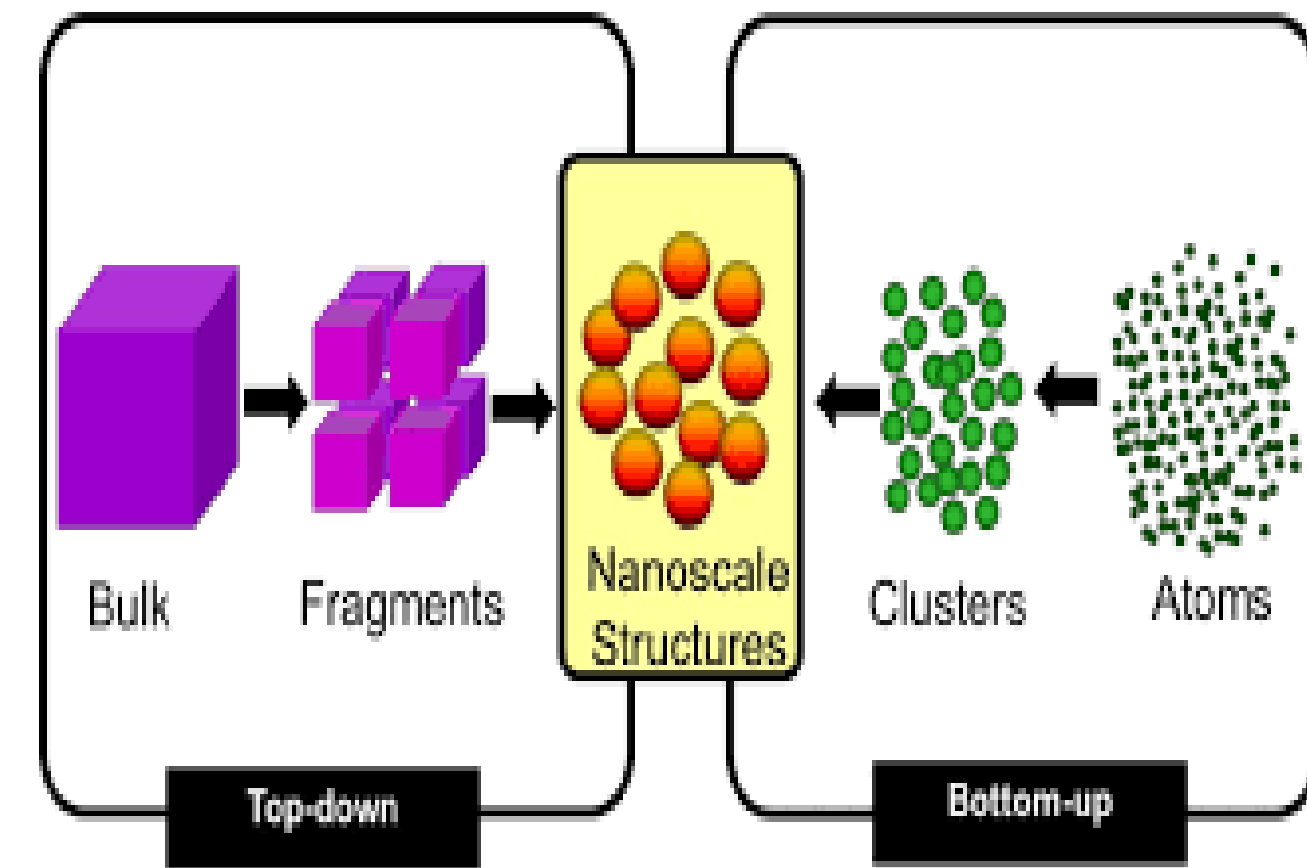




# TOP-DOWN APPROACH

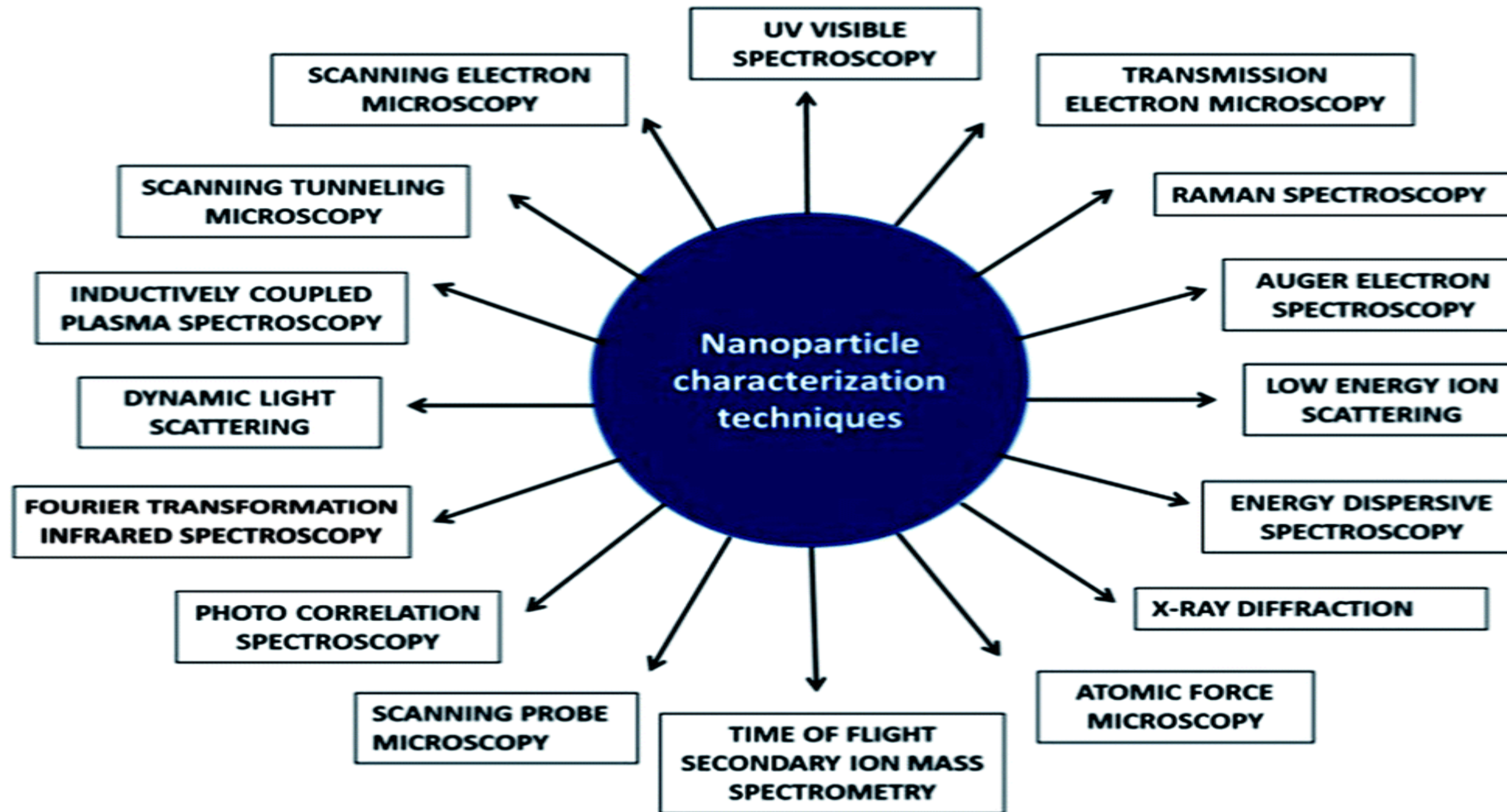


- In this approach, nanoscale devices are created by using larger, externally- controlled devices to direct their assembly.
- The top-down approach often uses the traditional workshop or micro- fabrication methods in which externally-controlled tools are used to cut, mill and shape materials into the desired shape and order.
- Attrition and milling for making nanoparticles are typical top-down processes.





# CHARACTERISATION OF NANOPARTICLES

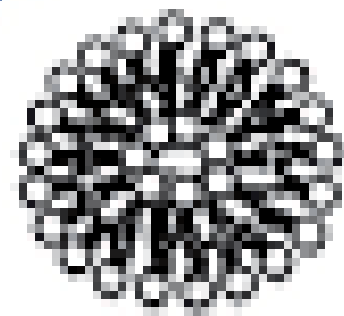




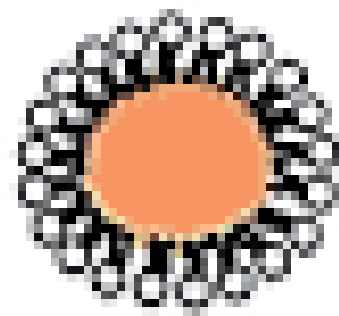
# TYPES OF NANOPARTICLES



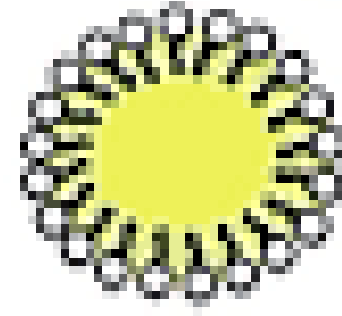
## Organic nanoparticles



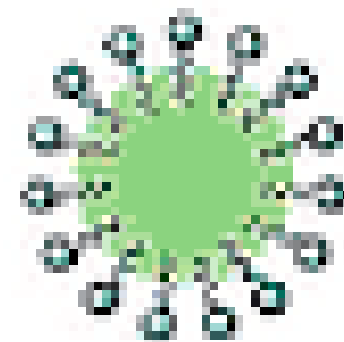
Liposomes



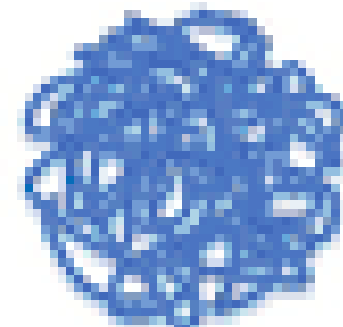
Solid-lipid nanoparticles



Nano-emulsions



Micelles

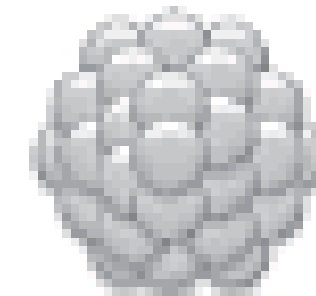


Polymeric nanoparticles

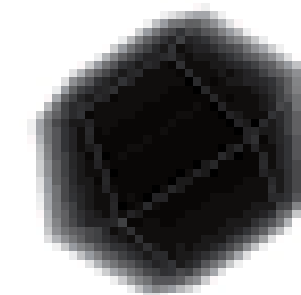
## Inorganic nanoparticles



Gold nanoparticles



Iron oxide nanoparticles



Hafnium nanoparticles



# ASSESSMENT

1. Write down the two approaches for nanoparticles synthesis?
2. Write any two aspects of nanotechnology?
3. Name any two top down methods of nanoparticle synthesis.



# SUMMARY



## REFERENCES

1. Dr. V. Veeraiyan, "Engineering Chemistry-II" VRB Pub. Co. Ltd, Chennai. 2016..
2. Wiley, "Engineering Chemistry", John Wiley & Sons. Inc, USA.
3. P.C. Jain & Monicka Jain, "Engineering Chemistry", Dhanapat Rai Publishing Company Pvt. Ltd. 2017.

**THANK YOU**