SNS COLLEGE OF TECHNOLOGY

Vazhiamyampalayam,Coimbatore-35

(An Autonomous institution)

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DEPARTMENT OF CHEMISTRY

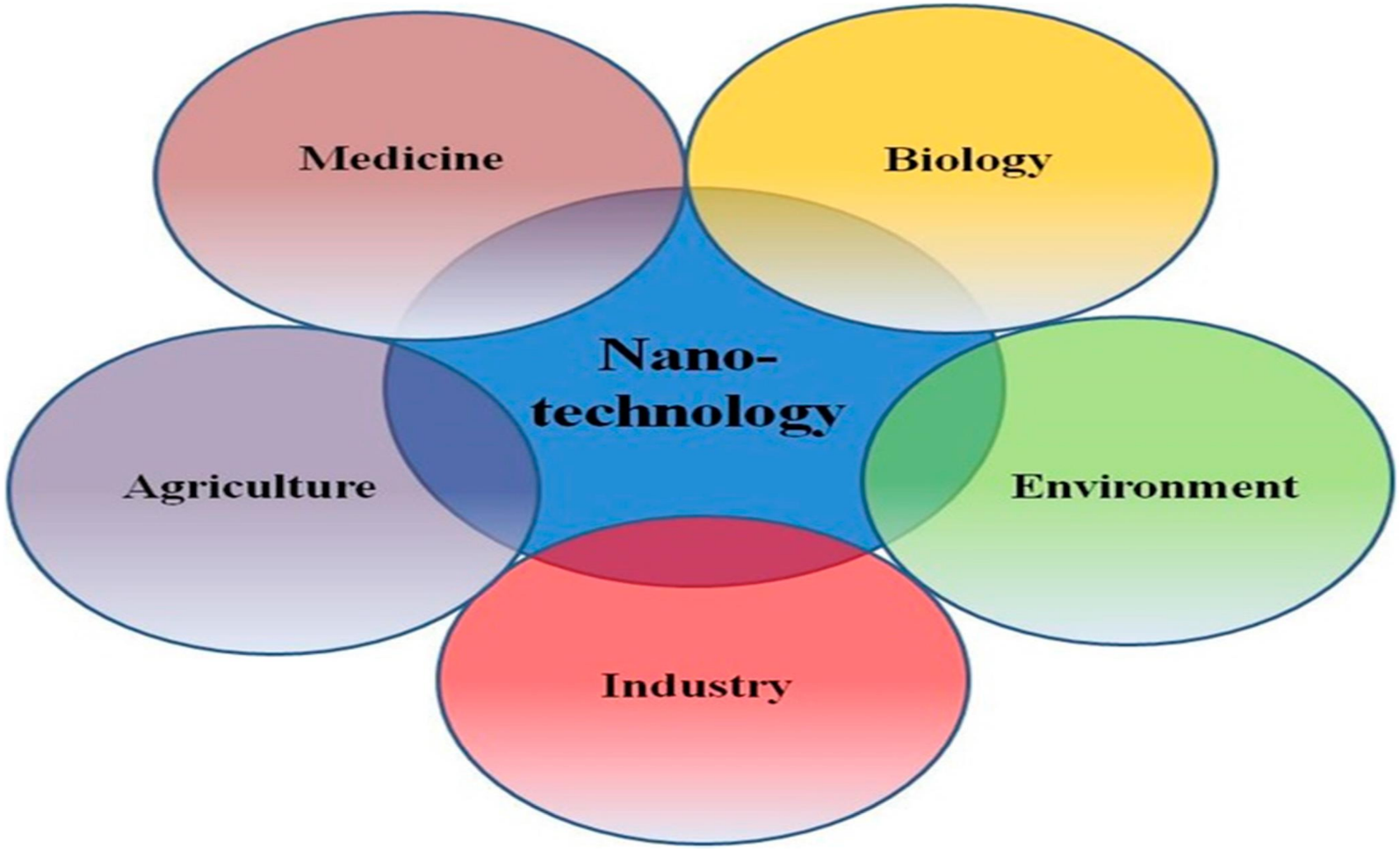
COURSE NAME : 23CHT101- ENGINEERING CHEMISTRY

I YEAR / I SEMESTER

UNIT : 3. NANOMATERIALS

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}).**

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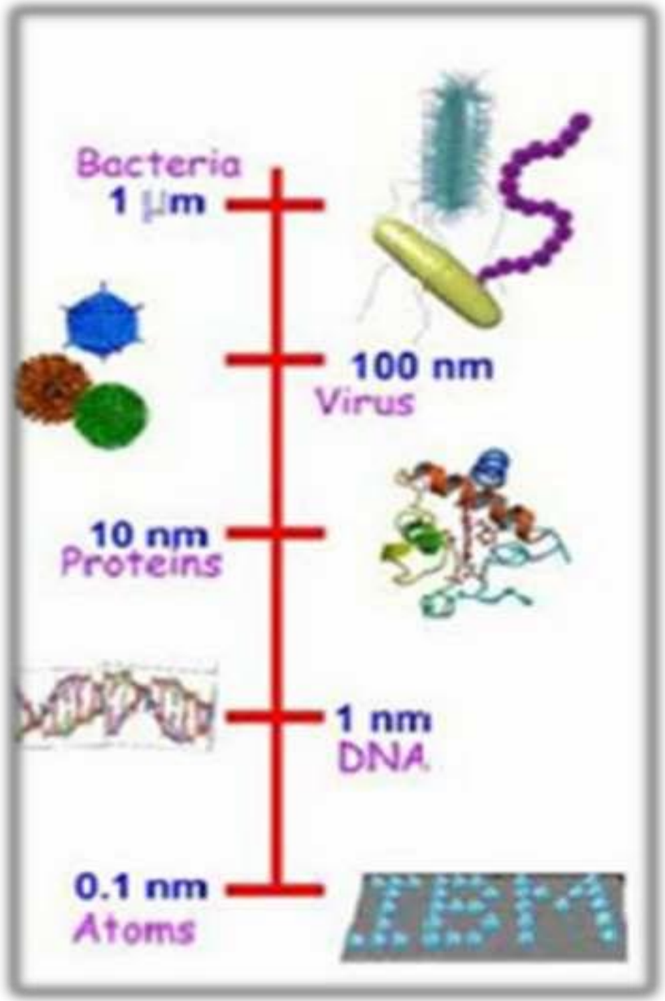
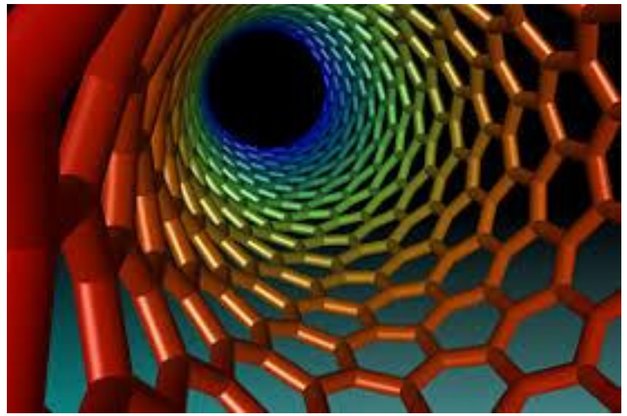
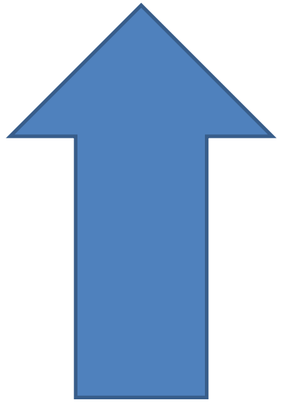


NANOSCIENCE AND NANOTECHNOLOGY

- 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.

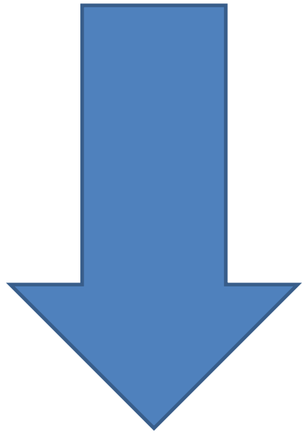


PROPERTIES OF NANOPARTICLES - BULK MOLECULES



Surface area
Ductility
Strength
Hardness
Toughness
Corrosion resistance
Wear resistance

NANOPARTICLES



Density
Melting point
Sintering time
Thermal conductivity
Electrical conductivity
Elasticity


ACTIVITY

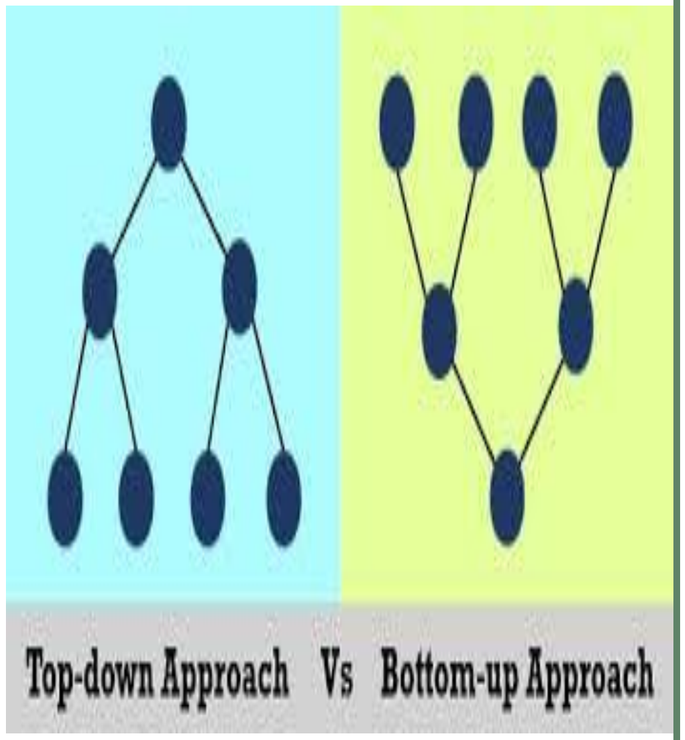
SYNTHESIS OF NANOPARTICLES

Two approaches:

- Bottom-up
- Top-down

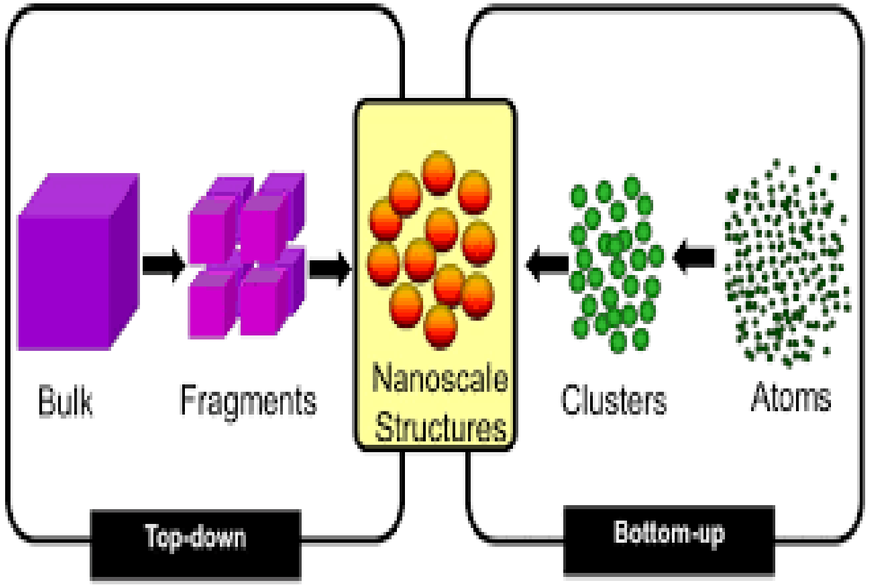
Bottom-up Approach

- 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

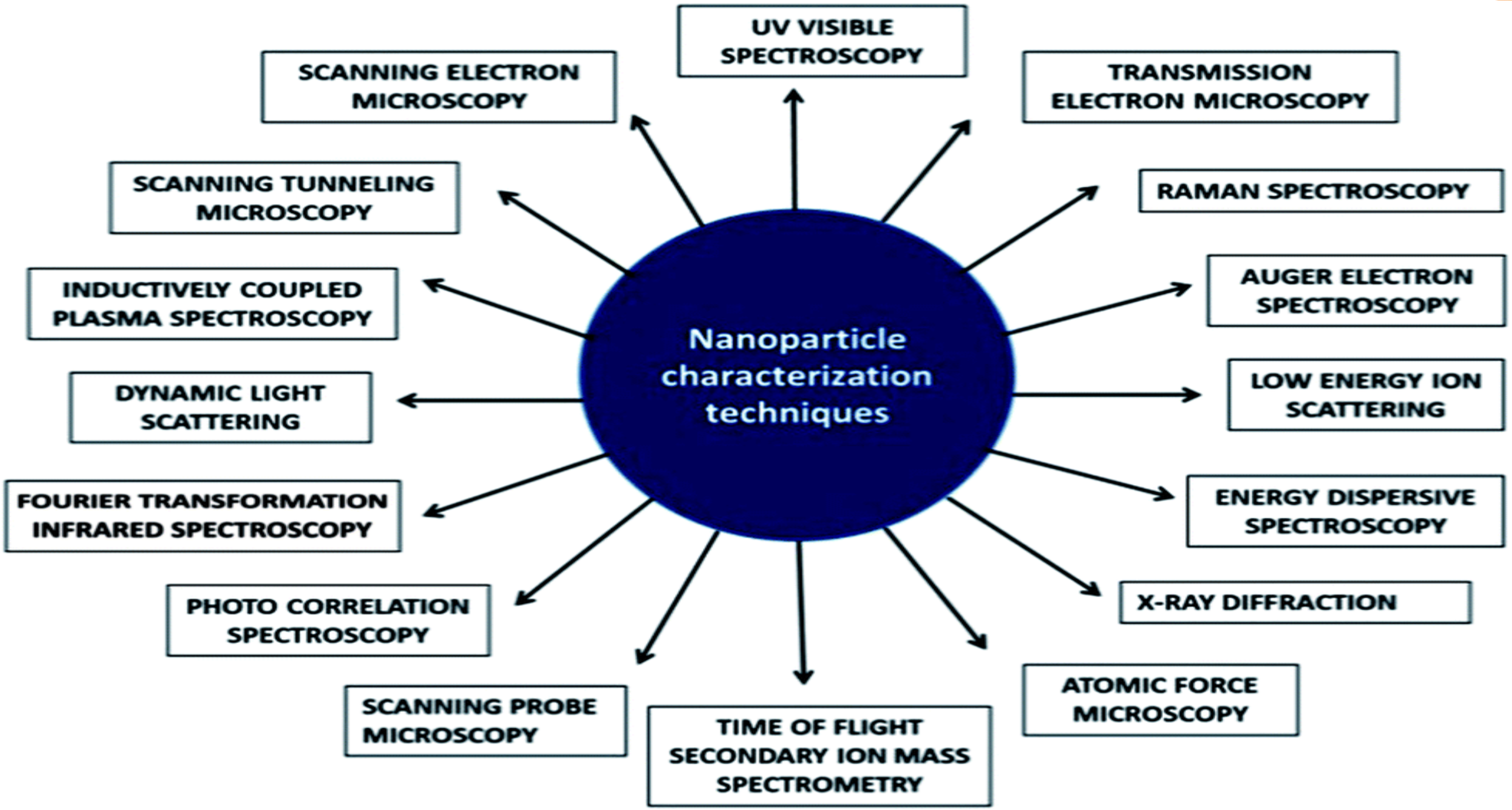


TOP-DOWN APPROACH

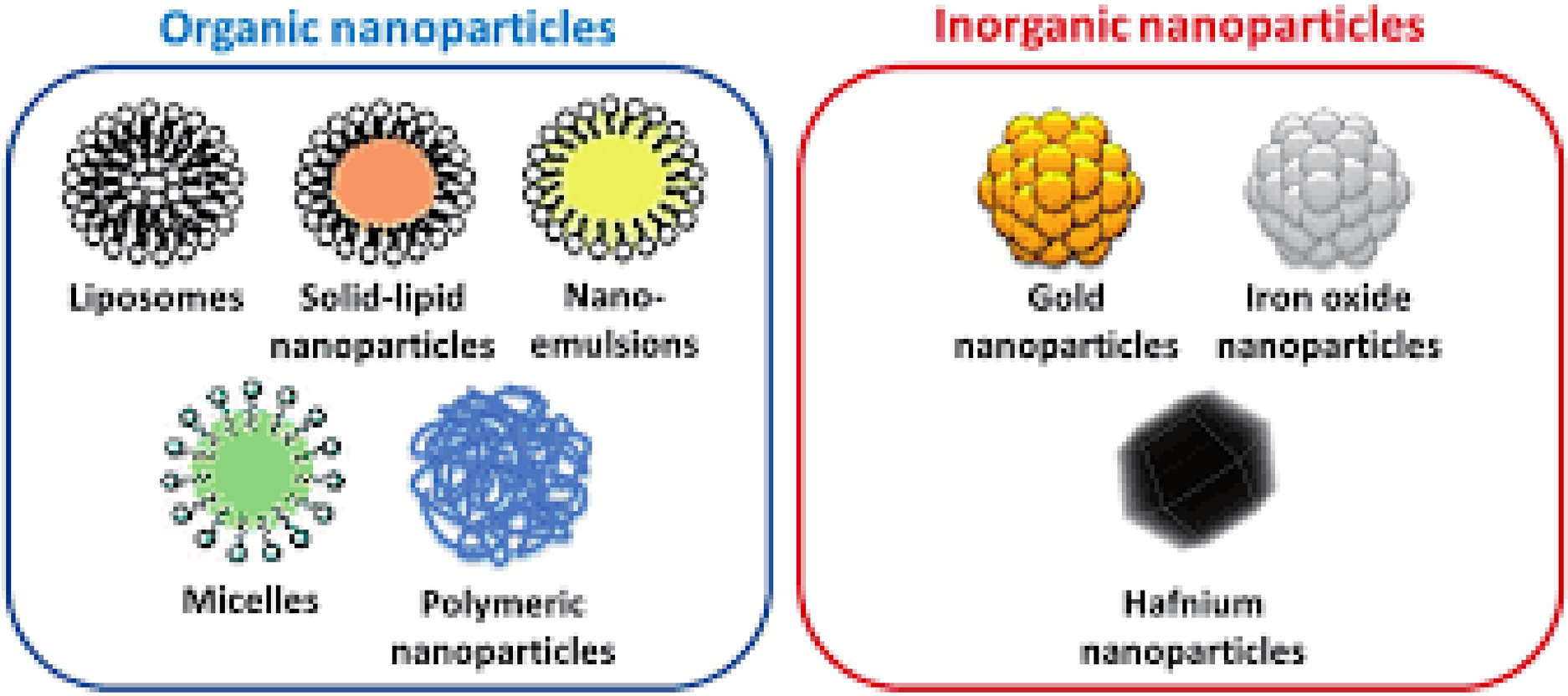
- In this approach, nanoscale devices are created by using larger, externally- controlled devices to direct their assembly.
- The top-down approach often uses the traditional workshop or micro- fabrication methods in which externally-controlled tools are used to cut, mill and shape materials into the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



CHARACTERISATION OF NANOPARTICLES



TYPES OF NANOPARTICLES



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 Publising Company Pvt. Ltd. 2017.

THANK YOU