APPLICAITONS OF NANO MATERIALS (OR) NANO PARTICLES

- Nano-technology finds significant impact on all most all the industries and all areas of society.
- Since nano-materials possess unique beneficial chemical, physical and mechanical properties, they can be used for a wide variety of applications

I. Medicine

- **Nano drugs:** Nano materials are used as nano drugs for the cancer and TB therapy.
- **Laboratories on a chip:** Nano technology is used in the production of laboratories on a chip.
- **Nano-medibots:** Nano particles function as nano-medibots that release anti-cancer drug and treat cancer.
- **Gold-coated nanoshells :** It converts light into heat, enabling the destruction of tumours.
- **Gold nano particles as sensors:** Gold nano particles undergo colour change during the transition of nano particles.
- **Protein analysis**: Protein analysis can also be done using nanomaterials.
- **Gold nanoshells for blood immuno assay:** Gold nano shells are used for blood immuno assay.
- **Gold nano shells in imaging:** Optical properties of the gold nano shells are utilized for both imaging and therapy.
- **Targeted drug delivery using gold nano particles:** It involves slow and selective release of drugs to the targeted organs.
- **Repairing work:** Nano technology is used to partially repair neurological damage.

II. INDUSTRIES

(i) As Catalyst

- It depends on the surface area of the material. As nano-particles have an appreciable fraction of their atom at the surface, its catalytic activity is good.

Example: Bulk gold is chemically inert; whereas gold nano-particles have excellent catalytic property.

(ii) In water purification

- Nano-filtration makes use of nano-porous membranes having pores smaller than 10 nm. Dissolved solids and colour producing organic compounds can be filtered very easily from water.
- Magnetic nano-particles are effective in removing heavy metal contamination from waste water.

(iii) In fabric industry

- The production of smart-clothing is possible by putting a nano-coating on the fabric.
- Embedding of nano-particles on fabric makes them stain repellent.
- Socks with embedded silver nano-particles fills all the bacteria and makes it odour free.

(iv) In Automobiles

- Incorporation of small amount of nano-particles in car bumpers can make them stronger than steel.
- Specially designed nano-particles are used as fuel additive to lower consumption in vehicles.

(v) In food industry

- The inclusion of nano-particles in food contact materials can be used to generate novel type of packing materials and containers.

(vi) In energy sector

- In solar power, nano-technology reduces the cost of photovoltaic cells by 10 to 100 times.

III. Electronics

- Quantum wires are found to have high electrical conductivity.
- The integrated memory circuits have been found to be effective devices.
- A transistor, called NOMFET, (Nano particle organic memory field effect transistor) is created by combining gold nano particles with organic molecules.

- Nano wires are used to build transistors without *p* - *n* junctions.
- Nano radios are the other important devices, using carbon nanotubes.
- MOSFET (Metal Oxide Semi conductor Field Effect Transistor), performs both as switches and as amplifiers.