Overview - Nanophysics

1. Definition - nanoscale, nanoscience, nanomaterial, nanoparticle, quantum dot, nanostructures.
2. Why properties change when we move from bulk to nano scale :
   (i) Surface area to volume ratio increases
   (ii) Band Gap changes (increases)
   (iii) Quantum Confinement or Electron Confinement comes into play - which in simple words means that when we move from bulk to nano sized paricles, particle is not free to have continuous values of energy and momentum.
3. Classification of Nanomaterials : can be done in two ways

Based on nature of material

   (i) Carbon Based like fullerenes and Carbon nanotubes
   (ii) Metal Based like nanogold, nanosilver
   (iii) Dendrimers - nanosized polymers with branched units
   (iv) Nanocomposites - multiphase solid material in which one type of nanoparticles are combined with other type of nanoparticles.

Based on dimensions exhibiting nano behaviour

   (i) 1-D only one dimension is in nano scale and other two are in bulk
   (ii) 2-D two dimensions are in nano scale and one is normal or bulk
   (iii) 3-D only all three dimensions are in nano scale e.g. nanoparticles

4. Properties of Nanoparticles/nanomaterials (in brief)
   (i) Optical (ii) Electrical (iii) Mechanical (iv) Chemical (v) Magnetic properties.
5. Applications of nanotechnology
6. Disadvantages/ risks of nanotechnology.
7. Potential of nanotechnology in future