

Al-Mustaqbal University-College

Department of medical physics

The Second Stage



First lecture

Nanoscience in Medical Physics

By:

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CHAPTER ONE

- ✓ **What is a Nano?**
- ✓ **What is a Nano-Material?**
- ✓ **What is Nano-science?**
- ✓ **What is Nano-technology?**
- ✓ **What are Nano-materials applications ?**

Introduction

✓ What is a Nano?

Metric system is a units used for measurement the length or distance

Nano is a unit used with the metric system, to measure the length or distance

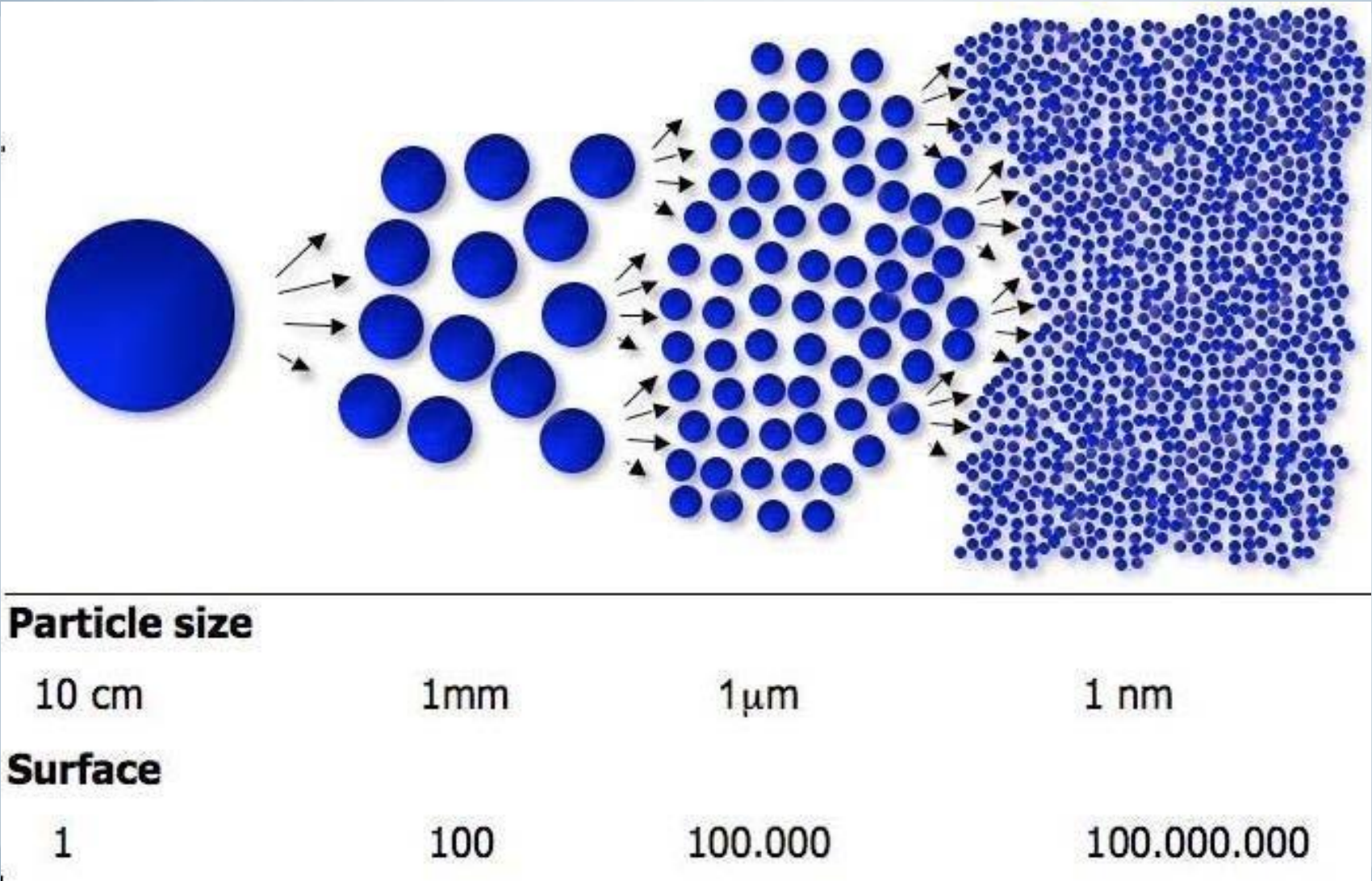
$$\underline{1\text{Nano}} = 10^{-9} \text{ m}$$

Metric Units		
Prefix	Symbol	Magnitude
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deka	da	10^1
unit	-	1
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

What is a Nano-Material ?

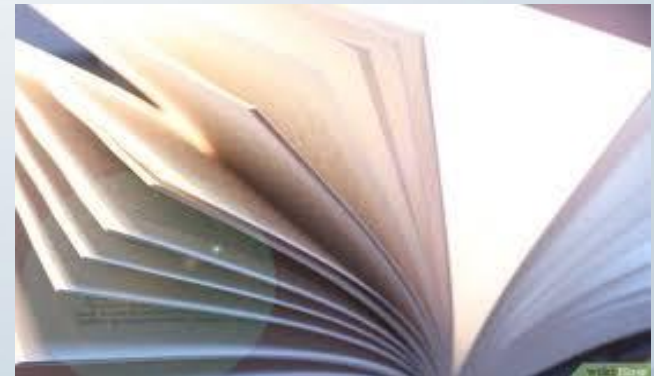
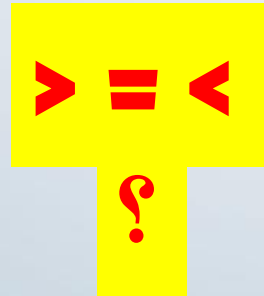
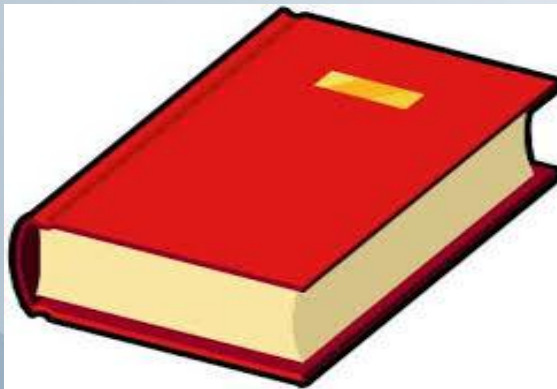
- The nano-material show a dimension of less than 100 nm,
- which has superior chemical and physical properties compared with those of their bulk phases or microstructure (big size)

Compared between bulk and nanomaterial



What happens with convert the material from big size to nano-size?

- Changing in the chemical and physical properties of nanomaterials due to of effects that are related to the size of nanostructures and surface state, where the dimensions and sizes of materials play an important role to determine their properties.



What is happening with convert the material from big size **to nano-size**?

What is the effect of reducing (decreases) the size of material on physical & chemical properties?

- ✓ **Reducing the size** of materials leads to **increase the surface area**
With **increase the surface area** leads to increase in the number of **surface atoms**.
- ✓ Where the **surface atoms** play an important role to determine their properties. These case leads to change in the properties of the nanostructures.

Question: What are the chemical and physical properties of material will change with convert their to nano-size (nano-material)?

Answer: The chemical and physical properties are;

Melting point

Optical properties

Mechanical properties

Magnetic properties

Electrical properties

Chemical properties

Nanoscience and Nanotechnology

- **Nano-science** is defined as the study of manipulation of materials at atomic, and molecular scales.
- **Nano-technology** are the design, characterization, production, and application of structures, devices, and systems by controlling shape and size at the nanoscale.



Thank
You

