

# LA MATERIA

## PARTE 1

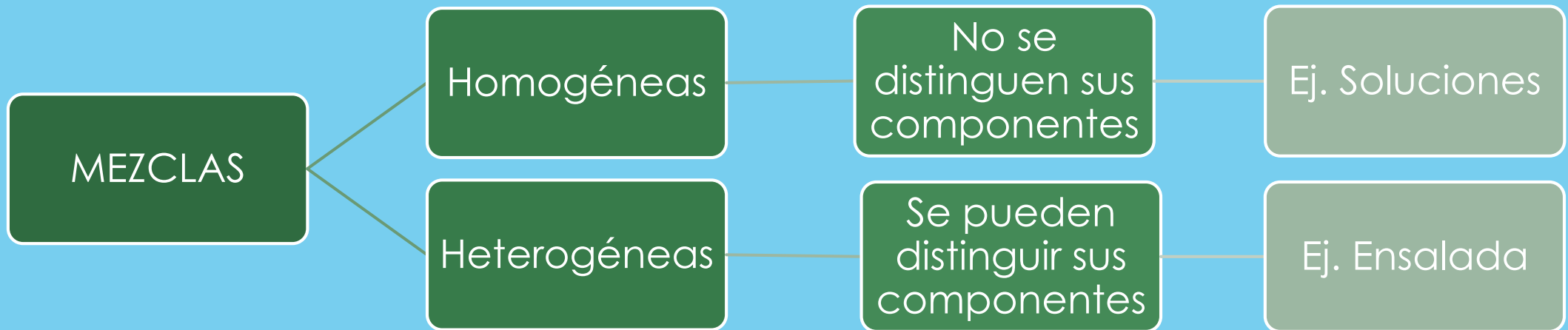
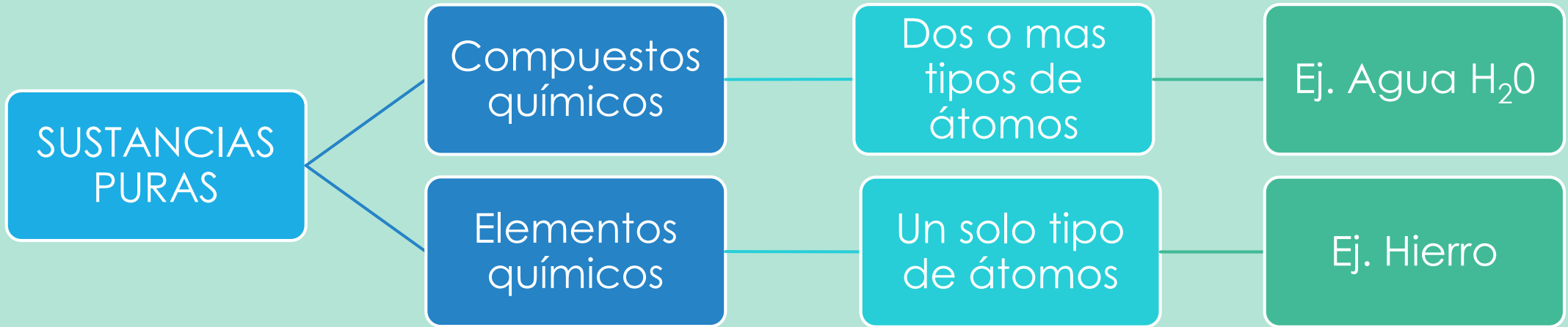
CARACTERÍSTICAS GENERALES  
PROPIEDADES.

# DEFINICIONES

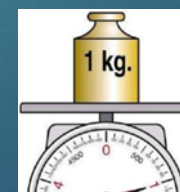
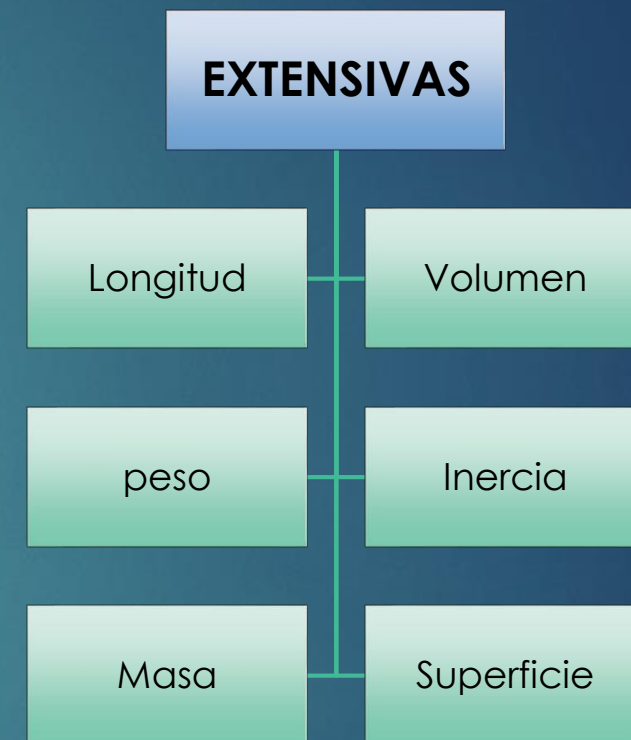
- ▶ La QUÍMICA, es la ciencia que estudia la naturaleza de la materia, sus propiedades, transformaciones y los cambios de energía que los acompañan.
- ▶ MATERIA es todo aquello que nos rodea que posee masa y volumen.
- ▶ Las SUSTANCIAS son un tipo de materia que tiene una composición definida y homogénea.

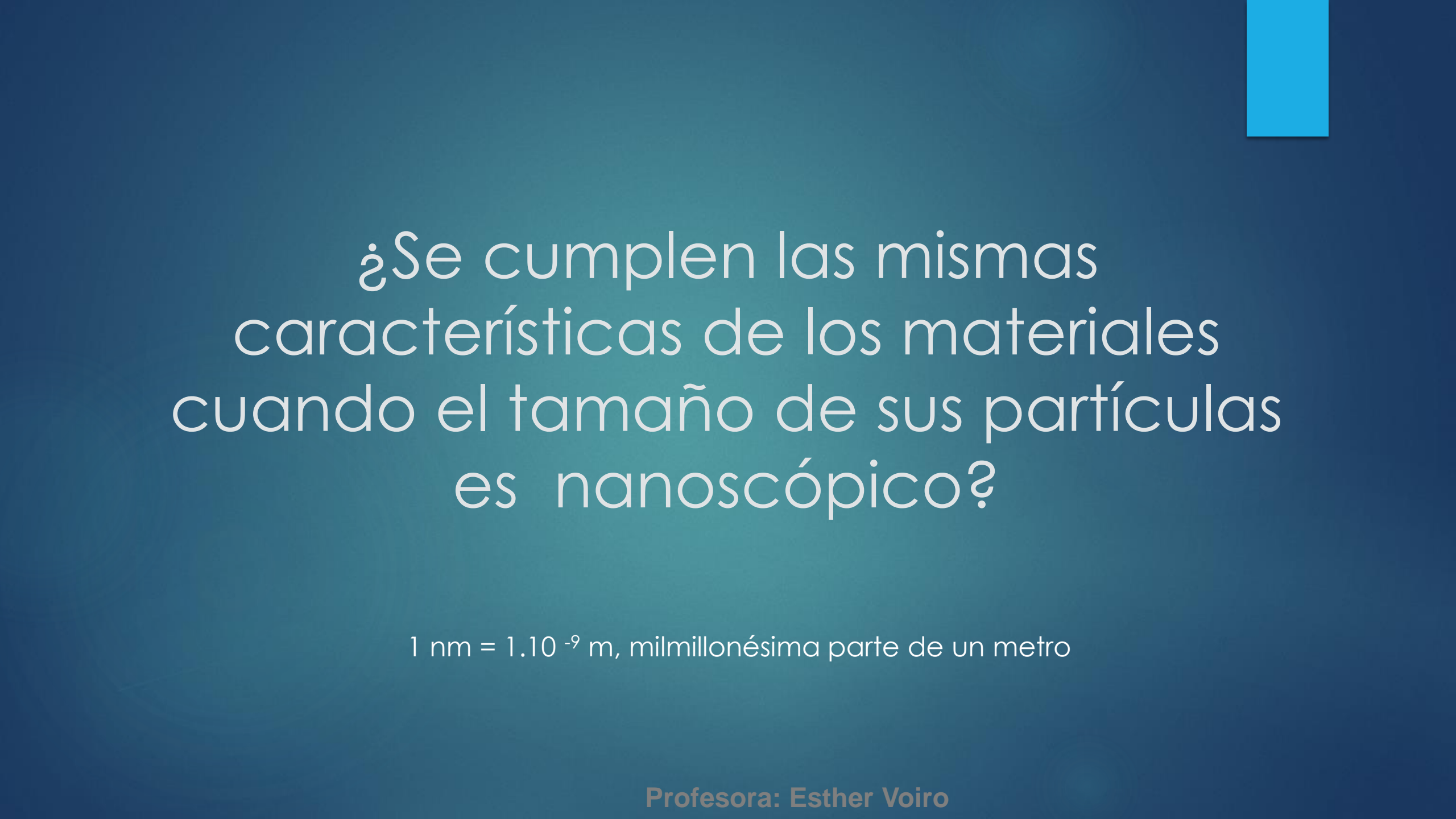


# CLASIFICACIÓN



# PROPIEDADES DE LA MATERIA

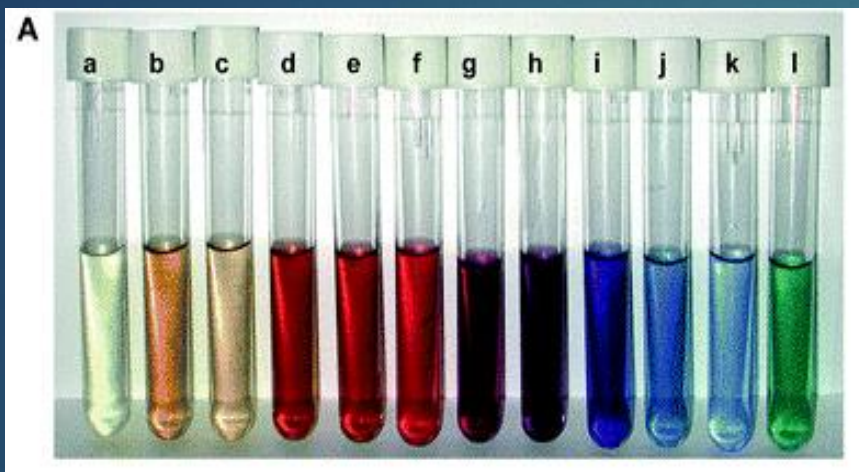




¿Se cumplen las mismas  
características de los materiales  
cuando el tamaño de sus partículas  
es nanoscópico?

1 nm =  $1 \cdot 10^{-9}$  m, milmillonésima parte de un metro





Colores que toma una suspensión coloidal de nano partículas de plata de diversos tamaños <30nm y formas (esfera, varilla, triángulo, galleta en diferentes proporciones).



MACRO

NANO





### The First Nanotechnologists

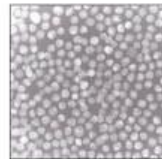
Ancient stained-glass makers knew that by putting varying, tiny amounts of gold and silver in the glass, they could produce the red and yellow found in stained-glass windows. Similarly, today's scientists and engineers have found that it takes only small amounts of a nanoparticle, precisely placed, to change a material's physical properties.

#### Gold particles in glass

Size\*: 25 nm  
Shape: sphere  
Color reflected:

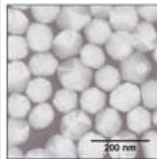


100 nanometers =  
0.0001 millimeter



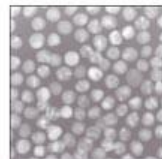
#### Silver particles in glass

Size\*: 100 nm  
Shape: sphere  
Color reflected:

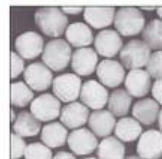


Had medieval artists been able to control the size and shape of the nanoparticles, they would have been able to use the two metals to produce other colors. Examples:

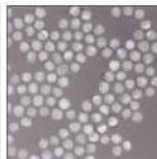
Size\*: 50 nm  
Shape: sphere  
Color reflected:



Size\*: 100 nm  
Shape: sphere  
Color reflected:



Size\*: 40 nm  
Shape: sphere  
Color reflected:

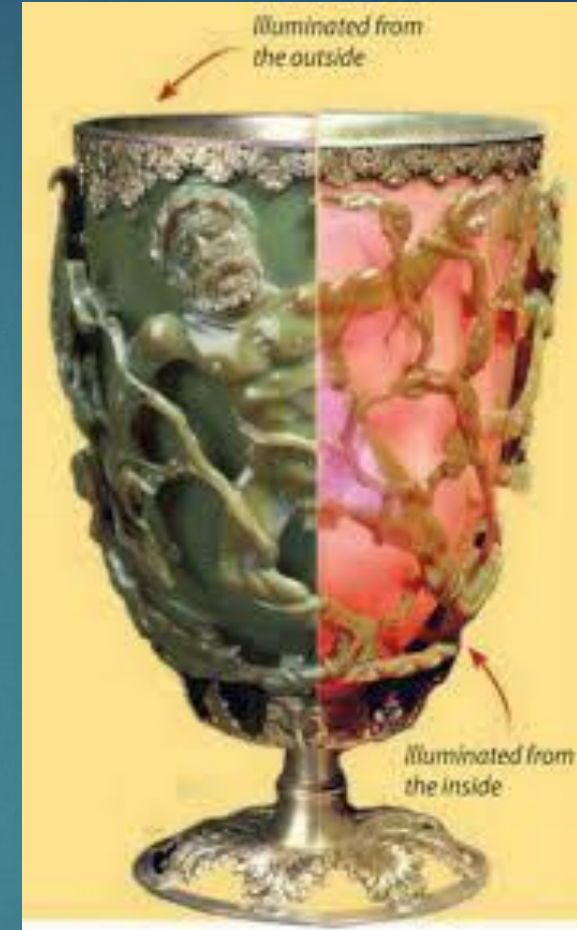


Size\*: 100 nm  
Shape: prism  
Color reflected:



Source: Dr. Chad A. Mirkin, Institute of Nanotechnology, Northwestern University

\*Approximate



Copa de Licurgo  
Siglo IV





¡Gracias por su atención!