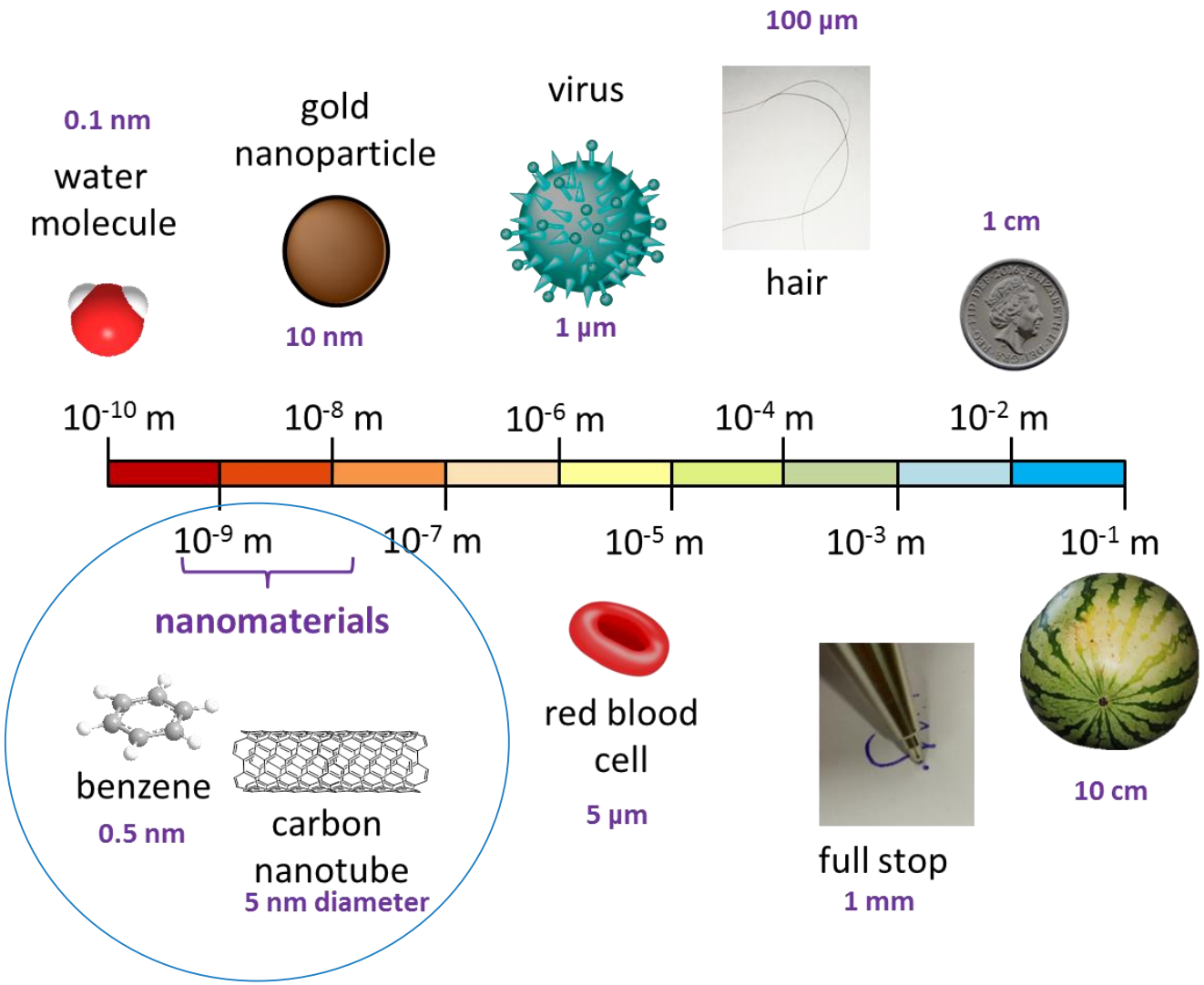
Nano in Life

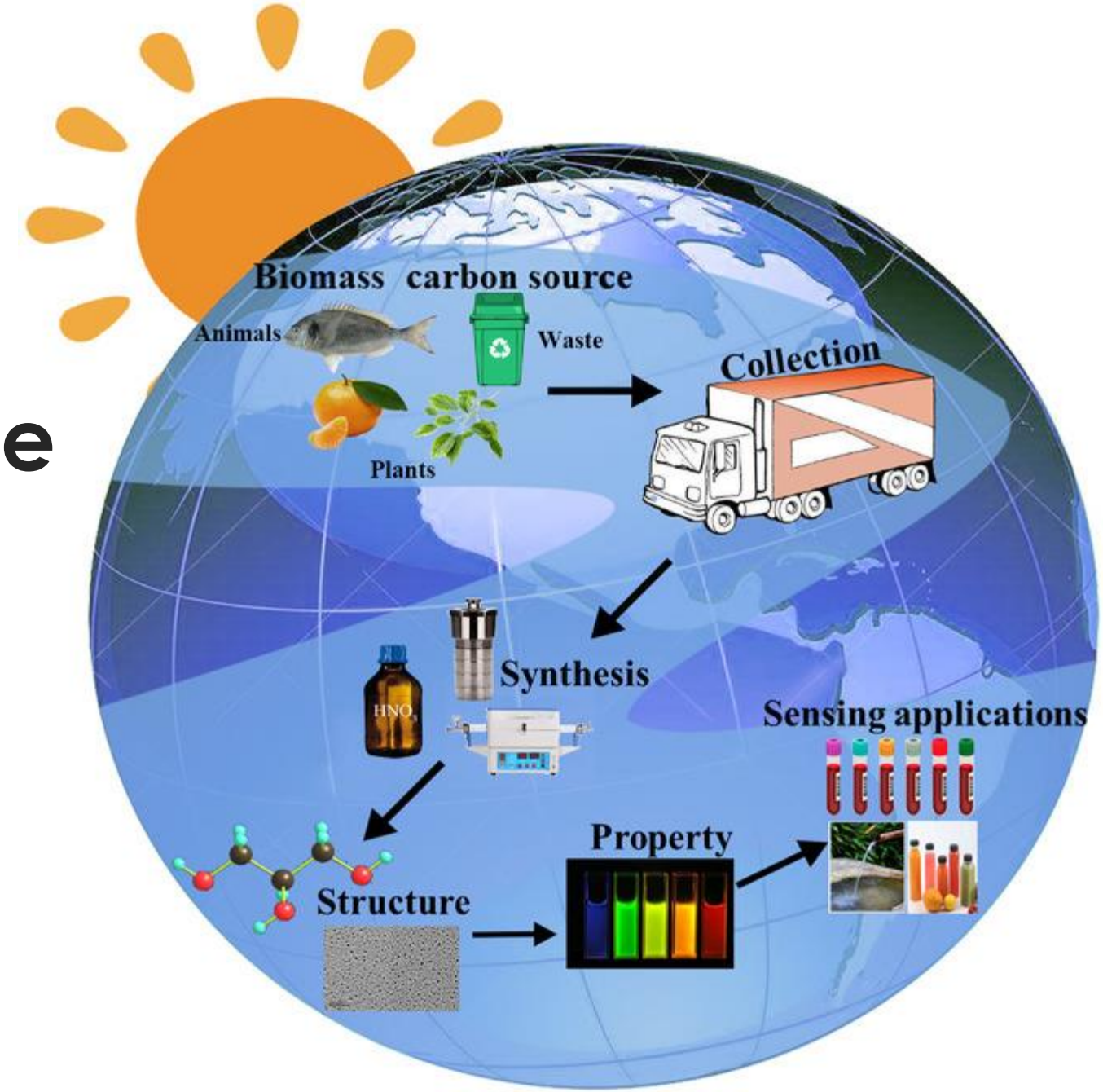


Carbon-based nanoparticles are one of the most common nanomaterials in healthcare and biosensing

Carbon dots and their applications

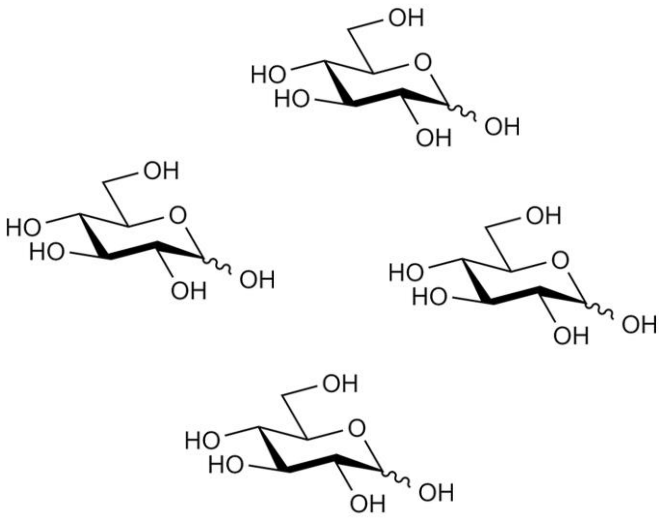
Fluorescent Carbon Dots Found from Egg Yolk Oil

Carbon source in Life
to make nanosized
carbon dots



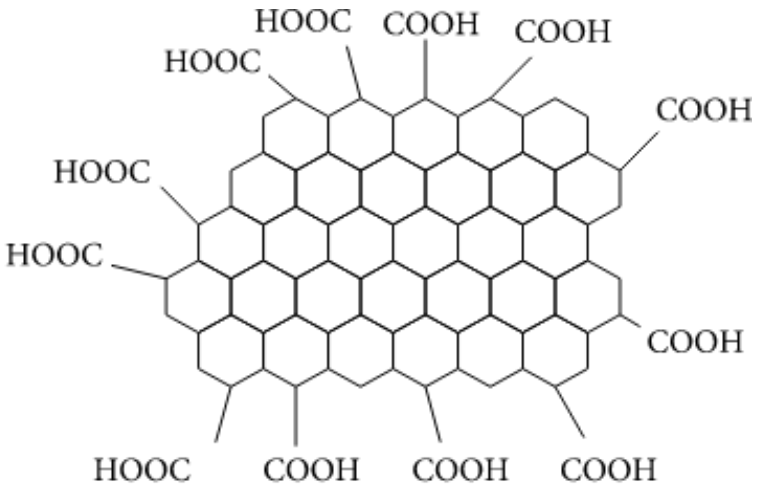
Carbon dots by microwave cooking

Glucose



Microwave cooking

Carbon dot



3-7 nm

Carbon dots by microwave cooking -Let's cook now!

Safety:

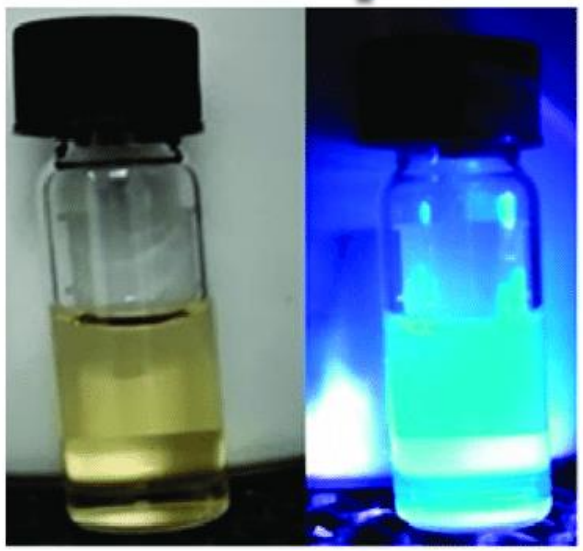
- Wear eye protection
- Chemical gloves recommended

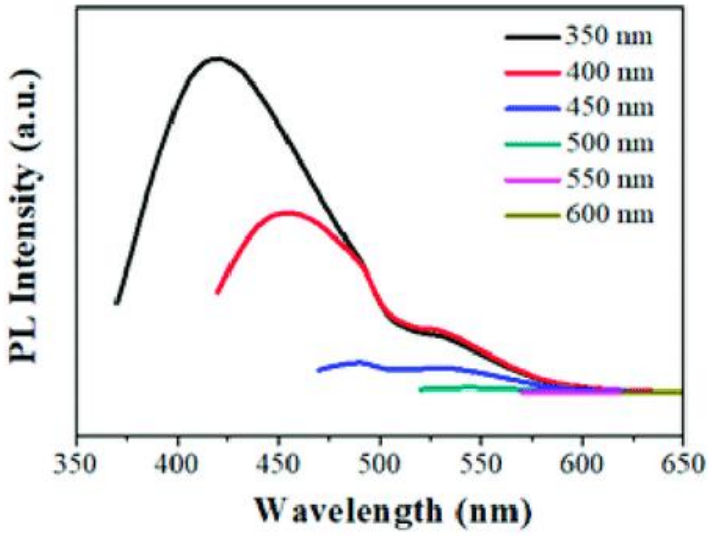
Procedure:

1. 300 µL of a 2.9 M glucose solution (in deionized water)
2. Glucose solution is mixed with 5 mL of ethylene glycol
3. The mixture is heated in the microwave oven at high power (1000 W) for 5 min
4. Cool down the resulting carbon dots solution to room temperature
5. Products are filtered with a 0.22 µm filter membrane

Let's shine the light

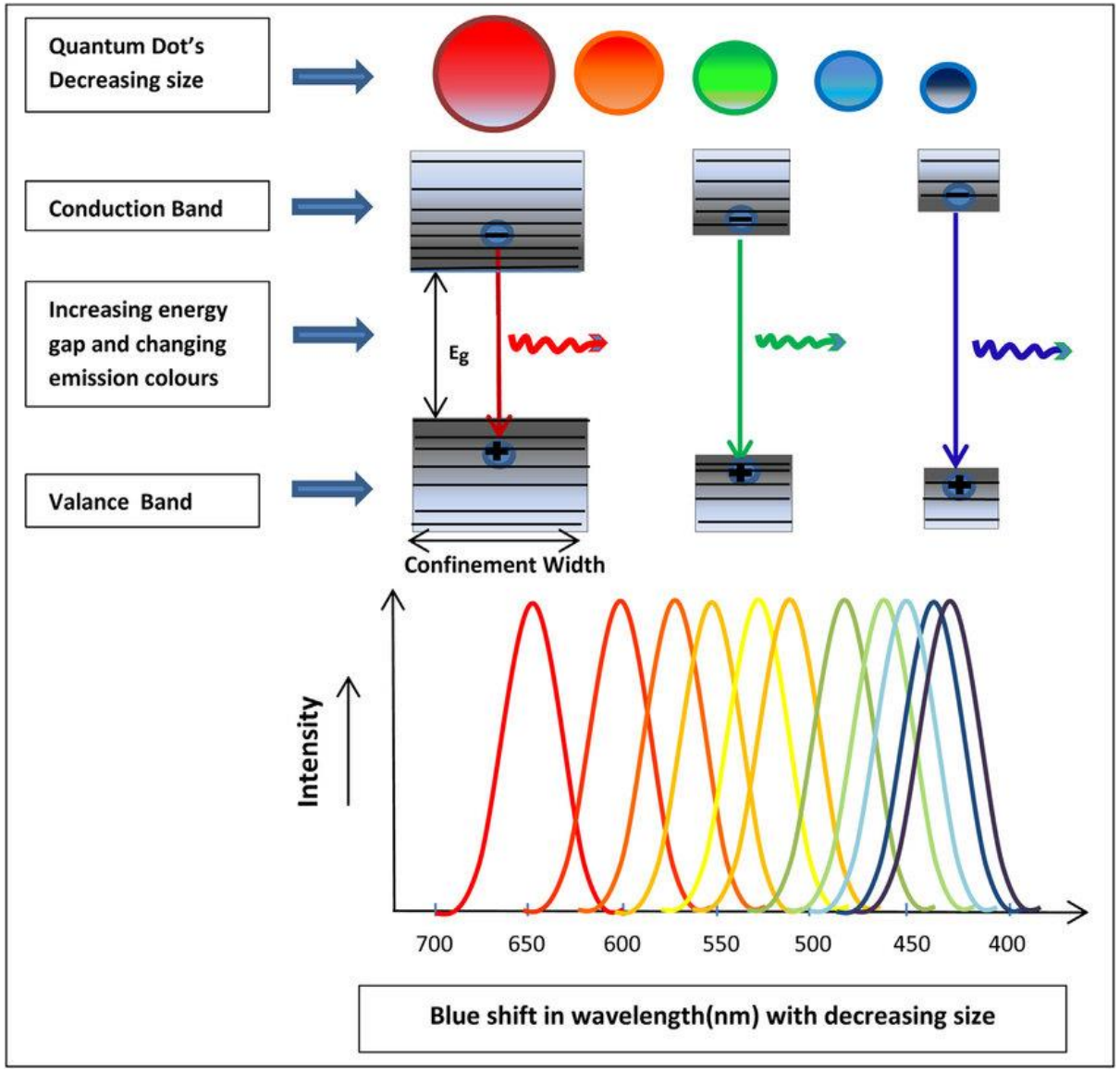
Handheld UV light





Light from Quantum Dot (QD)

QDs are nanoscale crystals that can transport electrons. When UV light hits these **semiconducting** NPs, they can emit light of various colors.



https://www.nanowerk.com/what_are_quantum_dots.php

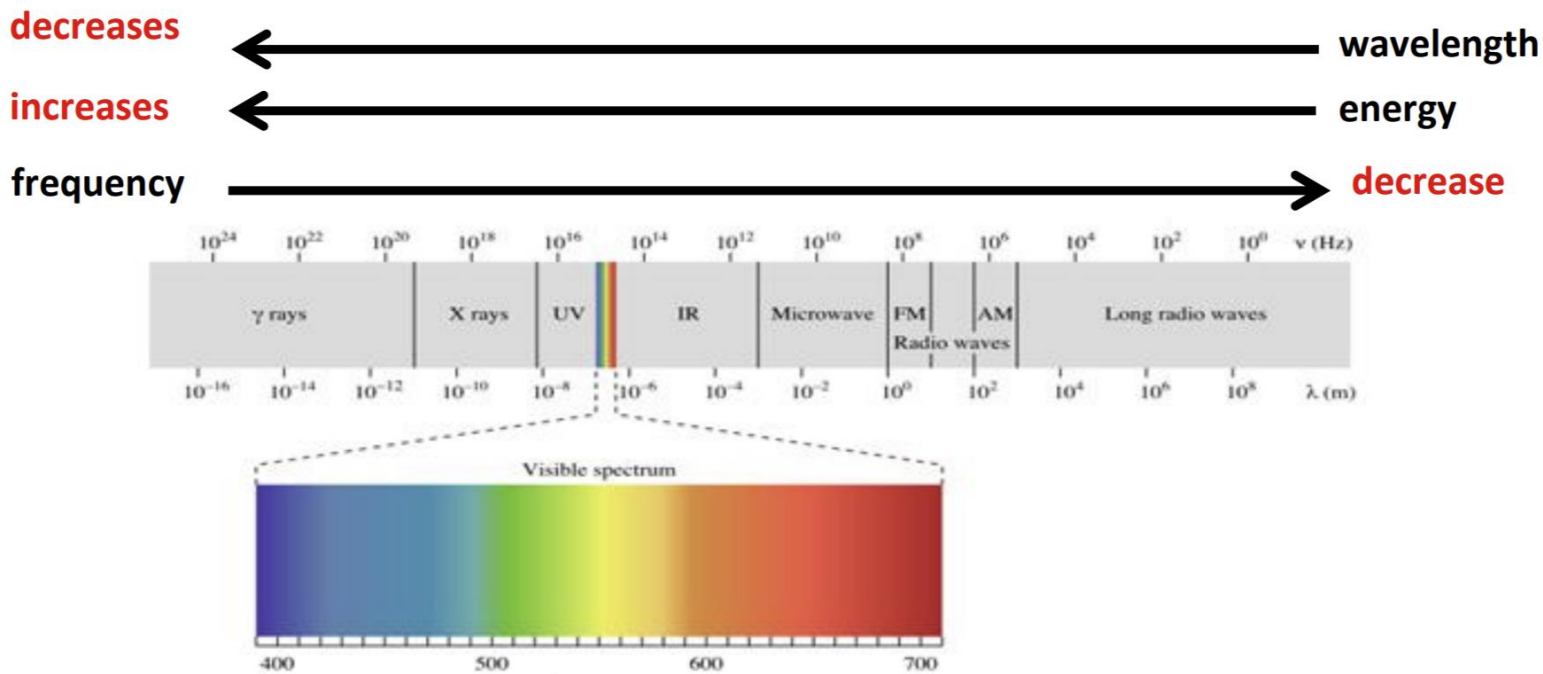
A photon is defined as a packet of light energy that has a collection of wavelengths. In physics, the energy of such a photon is defined as:

$$E = hf = \frac{hc}{\lambda}$$

where:
E = energy (J)
h = Plank's constant (6.626×10^{-34} J*s)
c = speed of light (3.0×10^{8} m/s)
λ = light wavelength (m)
f = frequency (1/s)

Sunlight is composed of various wavelengths of light that span various energy values, with ultraviolet (UV) being the highest energy and infrared (IR) being the lowest energy. The light between these two limits is the visible light range. See the electromagnetic radiation scale, below.

1. Using the energy equation above, indicate "increases" or "decreases" for each arrow.



Questions!