

What's So Big about Nanotechnology? Worksheet

Post-Lab Questions

A. How Big? How Small?

- Number the objects below from 1 to 15, with 1 being the smallest and 15 the largest.

___ Basketball player	___ Earth	___ Red blood cell
___ Blue whale	___ Galaxy	___ Solar system
___ Carbon nanotube diameter	___ Grain of salt	___ United States
___ Cruise ship	___ Nucleus of hydrogen atom	___ Water molecule
___ Dime	___ Paramecium	___ Wavelength of visible light
- Which objects were more difficult to arrange correctly? Why do you think this is so?
- Would a carbon nanotube that is 4 nm long and 2 nm wide be visible under a light microscope? Why or why not?

B. Properties of Ferrofluid

Observations

Petri Dish	Water + Iron Filings	Ferrofluid
Description of Contents		
Reaction to a Magnetic Field		
Movement of Penny in Presence of Magnetic Field		

- Describe the difference in the movement of the penny with respect to the ferrofluid with and without the presence of a magnetic field (steps 2 and 6 of Activity B *Procedure*). Explain your observations.
- Use information from the *Background* section along with your observations to explain why ferrofluid is considered a “nano” product.
- NASA first explored the use of ferrofluid to control liquid rocket fuels in zero gravity. What other possible applications of ferrofluid can you think of?

C. Encapsulation in Medicine

Observations

Well	Observations
A1	
A2	
A3	
B1	
B2	
B3	

1. Explain the difference in color between the spheres that formed in well A1 and the spheres formed in well B1.
2. Explain any changes observed in and around the spheres in wells A2 and A3.
3. Explain any changes observed in and around the spheres in wells B2 and B3.
4. This activity is a macroscale model of what could take place at the nanoscale in medicine. What questions would need to be considered in using encapsulation to deliver chemotherapeutic drugs to only cancer cells?

D. Water-Repellant Sand

Observations

Steps	White Sand	Mystic Sand
4		
8-10		
11		
12-13		

1. Describe how the two types of sand exhibit either hydrophobic or hydrophilic properties.

2. Roots of most plants need water and air. If plants are over-watered, air pockets in the soil become filled with water and the tiny root hairs cannot get needed oxygen. How would adding Mystic Sand to potting soil help with the problem of overwatering?

3. The textile industry has used nanotechnology to develop fabric that repels liquid. If you were to design an experiment to test the effectiveness of liquid-repellant fabric, what question might be asked that would begin the process of investigation?