THE FUTURE IS...
N.E.A.R.
(Nanotechnology Education And Research)
North Penn High School Engineering Academy

Lesson 03 Nanotechnology Pre-assessment

Name _____ **Date** _____ **Period** _____

Instructions:

For this activity, please answer the following questions to the best of your ability. At this time, do not use any assistance from the Internet or books. This is a pre-assessment of your knowledge. Place your answers directly below each statement in red. This pre-assessment is utilized to gain your knowledge about nanotechnology and electrospinning prior to beginning this activity.

Nanotechnology Basics

1. The prefix "nano" comes from a Greek word meaning _____.
2. What is a nanometer?
3. What is the typical range (in nm) to be considered nano?
4. If a nanometer were as big as the width of a pin head, about how long would a meter be?
5. What is a micrometer (micron)?
6. What is the average diameter of a human hair?
7. How would you measure the diameter of a hair?
8. What is the unit of measure called the Angstrom?
9. How many hydrogen atoms lined up "shoulder to shoulder" would fit in a one nanometer space?
10. What is a nanonewton?
11. Since traditional Newtonian Physics does not apply in the nano world, what other field within Physics must be utilized?
12. What is the confinement theory?
13. What is meant by the term convergence?
14. What is Moore's Law?
15. Who started the revolution of thinking at the sub-micron level?

16. What are the benefits of nanotechnology?

17. What are the downfalls of nanotechnology?

Electrospinning Basics

18. What is electrospinning?

19. What are the two major ways that can you electrospin? (Orientation)

20. How can this process produce nanofibers?

21. What is a kilovolt?

22. How many volts/cm are typically used in an electrospinning apparatus?

23. What electrical principle is the key to the electrospinning process?

24. What are the contributing factors that control the fiber diameter in an electrospinning apparatus?

25. What environmental conditions affect the electrospinning process?

26. What are the necessary materials and equipment to electrospin?

27. What are the main influential factors/conditions that affect the resulting fiber?

Polymer Basics

28. What is a polymer?

29. What is molecular weight?

30. What effect does molecular weight have on fiber production?

31. What is DeIonized water?

32. What is PEO?

33. Where is PEO used commercially?

34. What polymers are typically used in the formation of conductive fibers?

35. What is a solvent?

36. What is a solute?

37. What is meant by the term, weight percent?

38. How do you calculate the weight percent of a polymeric solution?

39. How do you prepare a polymer for electrospinning?

40. What is the difference between weight percent and volume percent?

41. How do you prepare a polymer solution for electrospinning?

42. What is viscosity?

43. How do you measure viscosity?

44. What is a MSDS and what does it tell a consumer?

45. What is statistical analysis?

Measurement and Quantification

46. How do you measure the strength of a nanofiber?

47. How can you manipulate a nanofiber?

48. What equipment (instruments) are used in the study of nanotechnology?

49. What is a SEM?

50. What is a TEM?

51. What is a STM?

52. What is Raman Spectroscopy?

53. What is FTIR?