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Answers

Description: Kent Street nameplate with shield-color

**A1CHE 2015**

**Properties and Structure of Materials**

**Extended Response Validation Test**

1. ***Refer to the ‘GLOSSARY’ section and find the definition of the following terms:***
2. ***Nanoporous*** – Substances that have holes or pores on the nanoscale, used, for example, to separate particles or molecules by size.
3. **Colloid** - Nanoscale or microscale particles suspended in another medium; colloids include gels, aerosols, and emulsions.
4. **Nanoscience** – The study of unique properties of matter at the nanoscale; an interdisciplinary field of science combining physics, materials science, the chemistry of complex molecules, and related disciplines.
5. A sheet of paper is about 100,000 nanometers thick and A strand of human DNA  is 2.5 nanometers in diameter
6. ***Refer to the ‘Working at the nanoscale’ section***The earliest example of this type of process was accomplished by IBM on November 11, 1989, when researcher Don Eigler and colleagues spelled the company logo in atoms. He and his team were able to literally [move 35 xenon atoms on a background of copper atoms to spell out IBM](http://www-03.ibm.com/press/us/en/photo/28500.wss).
7. ***Refer to the ‘Manufacturing at the nanoscale’ section to answer the following question.***
8. What does the acronym NNN stand for?
9. What does the NNN do?

The [National Nanomanufacturing Network (NNN)](http://www.nanomanufacturing.org/) is an alliance of academic, government and industry partners that cooperate to advance nanomanufacturing strength in the U.S. The NNI and its member agencies actively participate in, support, and contribute to the NNN in its mission to advance nanomanufacturing.

1. List three (3) material properties that can be improved through nanomanufacturing processes.

Such nanomaterials can be stronger, lighter, more durable, water-repellent, anti-reflective, self-cleaning, ultraviolet- or infrared-resistant, antifog, antimicrobial, scratch-resistant, or electrically conductive, among other traits. Taking advantage of these properties, today's nanotechnology-enabled products range from baseball bats and tennis rackets to catalysts for refining crude oil and ultrasensitive detection and identification of biological and chemical toxins.

1. The scanning tunneling microscope (STM) is among a number of instruments that allows scientists to view and  manipulate nanoscale particles, atoms, and small molecules. Its development earned its inventors, Gerd Binig and Heinrich Rohrer, the Nobel Prize in Physics in 1986.