Molecular Design

Your assignment is to communicate scientific and technical information about how and why the molecular-level structure of a material affects its properties, and how this is important in the functioning of designed materials.

This is a broad topic, so we suggest selecting a particular material. The textbook is a good source of information on semiconductors, including transistors and photovoltaic materials.

Other materials you might research include versatile carbon-based materials such as diamonds (which are fabricated in industrial processes), carbon nanotubes (a tube held together by strong carbon-carbon bonds), and Vantablack. Vantablack is a material made of tightly aligned carbon nanotubes, which cause incoming light to bounce around repeatedly: This molecular-level structure makes Vantablack the darkest, blackest artificial substance ever created. You may also research amorphous metals, such as Liquidmetal®: Its irregular structure prevents planes of atoms from sliding past one another, hindering the standard process that leads to permanent deformation. Or investigate the molecular structure of hydrocarbons, which lead to materials as diverse as paraffin wax, Teflon, and bulletproof glass—materials composed of almost the same atoms, but arranged in different ways. There are so many possibilities! You might also research the topic of molecular engineering in general. Institutes at the University of Chicago and elsewhere are dedicated to this topic. Make sure to cover a specific example.

When presenting this information, use technically accurate words, and explain any terms that your audience is likely not to know. Recognize that your audience is taking a physics class, not an engineering materials science class, so explain the fundamentals of the topic as needed. Recognize that your audience might be biased to designed materials they are familiar with, so strive for interesting examples they can relate to.

Plan and organize your presentation, using multiple drafts as necessary, and consider posting some work on the Internet for feedback even before the presentation. Consult a variety of resources on this project—texts, journal articles, sources on the Internet, and so on. Assess the accuracy and knowledge of the sources you use. When presenting, have a consistent structure so that relationships are clear and the presentation flows. Vary your syntax and sentence length, and use other media as appropriate.