

Teacher's Preparatory Guide

Lesson #4 – Ethics in Nanotechnology and Cosmetics

Purpose: The purpose of this lesson is to familiarize students with the ethical issues surrounding nanotechnology and the cosmetic industry.

Time required: 3 class periods of 50 minutes

Level: AP Chemistry, Honors Chemistry, and/or Human Anatomy

Teacher Background: Teacher will have completed Lessons 1 – 3 in order for students to understand the scientific background. To develop an understanding of the social and ethical issues of nanotechnology visit: <http://www.sei.nnin.org> as well as the web sites listed in the resource section of this unit. As with any new technology, issues of health and safety arise with the government and public. These issues are important to examine as nanotechnology continues to influence numerous consumer products.

Materials :

Computers with Internet access, handout, and rubric

Advance Preparation:

1. Teacher will have copies of the Student Guide made.
2. Teacher will have organized for computer use with Internet access.

Safety Information: monitor the computer use of every student

Directions for the Activity:

1. This activity is student centered for the first 2 lessons while they are doing their research. Set the stage for the activity by handing out the scenario/case study.
2. You can either break students into groups or they can form their own groups. Make sure that all students have clear directions and know how to use the computer and Internet for research.
3. For the presentation day of the lesson (day 3), you can be creative by trying to set-up a real FDA hearing. The teacher must act as moderator of the discussion and set the rules for speaking and responding.

4. Teacher and students will use a rubric for grading purposes. One has been provided (<http://rubistar.4teachers.org/index.php>) but teachers can make their own.

“Nano or NoNo”

In the cosmetics industry, nanotechnology used as a delivery system for vitamins and chemicals is becoming more popular. You have already investigated the chemical properties of these delivery systems in the lab and in the classroom. You are now going to look at the ethical issues surrounding this new technology.

The Federal Drug Administration (FDA) regulates twenty percent of consumer purchases including cosmetics; however, the FDA does not regulate technologies. A new British cosmetic company, NanoBeauty, wants to manufacture and distribute their products here in the United States. The NanoBeauty board, of whom some of you are members, will be presenting their product information to the FDA next week. Some of you are members of the FDA Product Review Committee and you must do research on NanoBeauty’s products prior to their presentation. After NanoBeauty’s presentation, you must decide if their products will be allowed to enter the U.S. cosmetic market.

Please make sure you address the following topics:

- How do NanoBeauty’s products function as Vitamin A delivery systems?
- Include the characterization of physical and chemical properties of nanoparticles.
- Are there any known risks associated with this technology?
- How will risks be communicated?

NanoBeauty will make its report to the FDA for approval on _____.

As part of your presentation to the FDA, NanoBeauty must have a PowerPoint and handouts. The FDA must be able to ask questions of the board and support any arguments you make based on research you have done on their products up for review. See the attached rubric for grading guidelines.

Class Debate : Nano or Nono

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Respect for Other Team	All statements, body language, and responses were respectful and were in appropriate language.	Statements and responses were respectful and used appropriate language, but once or twice body language was not.	Most statements and responses were respectful and in appropriate language, but there was one sarcastic remark.	Statements, responses and/or body language were consistently not respectful.
Information	All information presented in the debate was clear, accurate and thorough.	Most information presented in the debate was clear, accurate and thorough.	Most information presented in the debate was clear and accurate, but was not usually thorough.	Information had several inaccuracies OR was usually not clear.
Rebuttal	All counter-arguments were accurate, relevant and strong.	Most counter-arguments were accurate, relevant, and strong.	Most counter-arguments were accurate and relevant, but several were weak.	Counter-arguments were not accurate and/or relevant
Use of Facts/Statistics	Every major point was well supported with several relevant facts, statistics and/or examples.	Every major point was adequately supported with relevant facts, statistics and/or examples.	Every major point was supported with facts, statistics and/or examples, but the relevance of some was questionable.	Every point was not supported.
Presentation Style	Team consistently used gestures, eye contact, tone of voice and a level of enthusiasm in a way that kept the attention of the audience.	Team usually used gestures, eye contact, tone of voice and a level of enthusiasm in a way that kept the attention of the audience.	Team sometimes used gestures, eye contact, tone of voice and a level of enthusiasm in a way that kept the attention of the audience.	One or more members of the team had a presentation style that did not keep the attention of the audience.
Organization	All arguments were clearly tied to an idea (premise) and organized in a tight, logical fashion.	Most arguments were clearly tied to an idea (premise) and organized in a tight, logical fashion.	All arguments were clearly tied to an idea (premise) but the organization was sometimes not clear or logical.	Arguments were not clearly tied to an idea (premise).
Understanding of Topic	The team clearly understood the topic in-depth and presented their information forcefully and convincingly.	The team clearly understood the topic in-depth and presented their information with ease.	The team seemed to understand the main points of the topic and presented those with ease.	The team did not show an adequate understanding of the topic.

- **Cleanup: none**

Assessment:

A rubric will be completed by the teacher and by peers. A student's grade will be based on these two assessments.

Resources:

To learn more information for this lesson, here are some web sites with either educational resources or additional information to go along with this lesson:

- www.fda.gov
- <http://vm.cfsan.fda.gov/~dms/cos-206.html>
- <http://www.nanotechproject.com>
- <http://www.icta.org/nanotech/index.cfm>

National Science Education Standards

Content Standard E: Science and Technology (grades 9 – 12)

- Understanding about science and technology

Content Standard F: Science in Personal and Social Perspectives (grades 9-12)

- Personal and community health
- Natural and human-induced hazards
- Science and technology in local, national, and global challenges

NGSS

ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World