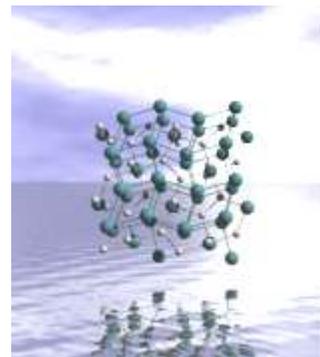


Materials Science Assignment

Background:

Materials science has driven the development of technologies such as plastics, semiconductors, and biomaterials.

The basis of modern materials science involves relating the desired *properties* of a material in a certain application to the *structure* of the atoms, ions, or molecules that make it up. The structure and properties of a material are determined by the particles that make it up and the way in which it has been processed into its final form.



Assignment

1. Choose a modern, man-made material.
2. Research its molecular structure: which inter- and intra-molecular forces are involved? How do they lead to the material's bulk properties? Refer explicitly to appropriate topics covered in this course (eg. geometry of bonds, intermolecular forces, crystal packing).
3. Research the *application, impact, and setting* (historical, technological) of the material.
4. Prepare a report on your research: 2-page report **OR** poster **OR** 7-min presentation

Here's a starter list of possible materials:

Polymers (eg. Kevlar, Teflon, Nylon, conductive polymers, PET, PE, PP, PVC, ABS, etc...)
Composites (eg. graphite, concrete); *Alloys*; *Ceramics* (eg. for space shuttle, in dental fillings);
Biomaterials (eg. artificial hips, blood vessels, lenses, skin, etc);
Nanomaterials (eg. nanocrystals, buckyballs); *Photoactive materials* (eg. dyes, sunscreen)
Superconductors (eg. in MRI machines or mag-lev trains); *Semiconductors*
Others (eg. aerogels, nanotubes, the nanovalve, OLEDs, ...).

Online: try https://www.sciencedaily.com/news/matter_energy/materials_science/ or google 'materials science' to get some good ideas

Sources

As always, you must document your sources properly, using a standard format of your choice. For a "Level 4+" evaluation [T/I], you should contact a primary source (university professor or graduate student) for information about your material (include printouts of any email correspondence).

Final Assignment – Report, Poster, OR Presentation

Regardless of format, your final product should include some diagrams or pictures to represent the microstructure of the material. You will also need ***proper documentation of all sources*** (using convention of your choice). Otherwise your assignment will not be accepted.

My Topic: _____

Due Dates: **Sources** **Outline** **Rough Draft** **Final**

Materials Science Assignment - Evaluation

	CRITERIA	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Thinking/Inquiry (30%)	Resource and Information Quality	<ul style="list-style-type: none"> Locates information of limited usefulness to the topic 	<ul style="list-style-type: none"> Locates information that is somewhat related to the topic 	<ul style="list-style-type: none"> Locates information that is clearly related to the topic 	<ul style="list-style-type: none"> Locates information that reflects a sophisticated understanding of the topic, including a primary investigator
	Recording information	<ul style="list-style-type: none"> Copies main ideas from resources 	<ul style="list-style-type: none"> Summarizes some main ideas from resources in own words 	<ul style="list-style-type: none"> Summarizes main ideas from resources in own words 	<ul style="list-style-type: none"> Reorganizes main ideas from resources to suit purpose
		<ul style="list-style-type: none"> Acknowledges some sources when prompted/or with frequent errors 	<ul style="list-style-type: none"> Acknowledges sources but does not use correct bibliographic conventions 	<ul style="list-style-type: none"> Acknowledges sources correctly 	<ul style="list-style-type: none"> Routinely acknowledges all sources correctly
Communication (20%)	Communication of information and ideas	<ul style="list-style-type: none"> Communicates information and ideas with limited clarity and precision 	<ul style="list-style-type: none"> Communicates information and ideas with some clarity and precision 	<ul style="list-style-type: none"> Communicates information and ideas with considerable clarity and precision 	<ul style="list-style-type: none"> Communicates information and ideas clearly and precisely
	Communication for different audiences and purposes	<ul style="list-style-type: none"> Communicates with a limited sense of audience and purpose 	<ul style="list-style-type: none"> Communicates with some sense of audience and purpose 	<ul style="list-style-type: none"> Communicates with a clear sense of audience and purpose 	<ul style="list-style-type: none"> Communicates by adjusting message and style to suit audience and purpose
	Format and Style	<ul style="list-style-type: none"> Report does not conform to assigned style or is missing critical elements 	<ul style="list-style-type: none"> Report conforms to assigned style but may be missing critical elements 	<ul style="list-style-type: none"> Report conforms to assigned style with no missing elements 	<ul style="list-style-type: none"> Report is complete and well-organized, with no missing elements
Knowledge (30%)	Understanding of basic concepts	<ul style="list-style-type: none"> Reflects limited understanding of the required concepts, principles, and theories 	<ul style="list-style-type: none"> Reflects partial understanding of the required concepts, principles, and theories 	<ul style="list-style-type: none"> Reflects a complete or nearly complete understanding of the required concepts, principles, and theories 	<ul style="list-style-type: none"> Reflects an insightful understanding of the required concepts, principles, and theories
	Use of information	<ul style="list-style-type: none"> Shows little evidence of having integrated research with in-class learning 	<ul style="list-style-type: none"> Attempts to integrate research with in-class learning 	<ul style="list-style-type: none"> Skillfully combines research with in-class learning 	<ul style="list-style-type: none"> Combines research with in-class learning in a fluent and skillful manner
Application (20%)	Transfer of knowledge	<ul style="list-style-type: none"> Transfers knowledge to unfamiliar contexts with limited effectiveness 	<ul style="list-style-type: none"> Transfers knowledge to unfamiliar contexts with some effectiveness 	<ul style="list-style-type: none"> Transfers knowledge to unfamiliar contexts with considerable effectiveness 	<ul style="list-style-type: none"> Transfers knowledge to unfamiliar contexts with a high degree of effectiveness
	Making Connections	<ul style="list-style-type: none"> Makes connections between science, technology, and society with limited effectiveness 	<ul style="list-style-type: none"> Makes connections between science, technology, and society with some effectiveness 	<ul style="list-style-type: none"> Makes connections between science, technology, and society with considerable effectiveness 	<ul style="list-style-type: none"> Makes connections between science, technology, and society with a high degree of effectiveness

Evaluation: /30T /20C /30K /20C = /100

Comments:

Materials Science Assignment - Evaluation

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Evaluation: /30T /20C /30K /20C = /100

Comments:

There are many websites associated with new materials. See:

1. <http://gajitz.com/meta/science/new-materials/>)
2. http://www.sciencedaily.com/news/matter_energy/materials_science/
3. <http://web.mit.edu/newsoffice/2014/materials-database-proves-its-mettle-with-new-discoveries-0204.html?tmpl=component&print=1>
4. <http://web.mit.edu/newsoffice/topic/materials-science.html>
5. <http://www.materialstoday.com/materials-chemistry/news/top-10-materials-news-from-february-2014/>

Sample Topics From Previous Years:

carbon fibre	silicone caulking	artificial blood vessels
pencil/eraser	aerogels	artificial skin
UHMWPE	spandex	nanoparticles
hockey puck	plexiglass	concrete
sunscreen	buckyballs	PABA
Kevlar	OLEDs	Twaron [®]
Teflon [®]	stainless steel	nanometer fuses
conductive polymers	superconductors	knife steel
nylon	PEVA	super glue
contact lenses	carbon nanotubes	indigo blue
carbon nanotubes	artificial hips	Gore-Tex [®]
dental fillings	transistors	PEBA
PVC	nanocrystals	Dyneema [®]
Zylon [®]	nanovalve	fibreglass