Project: Chemical bonding in man-made materials



To show what you have learned and understand about the way atoms form new compounds through chemical bonding, you will study a specific molecule's properties and structure and create a **visual product** that effectively communicates how chemical bonding works and why it matters. Your individual research should focus on something you are personally interested in and its connection to what we've been learning about the structure of substances. You should also specifically think about substances that have been created and developed by humans.

Start by thinking of topics that are of personal interest to you:

1. Name at least two or three things that are important or interesting to you. Are these things you'd like to learn more about? How can you connect these to what we're learning about in Chemistry?

Next, choose one of these possible topics and decide which one best fits with your personal interests:

- 2. Look at each of the categories your teachers have suggested below, and choose one part of one of the categories that best describes the topics you're interested in. If you need to, go do some basic background research on terms you aren't familiar with to see if they are a good fit for your interests.
- <u>Category A:</u> Biomedical molecules
 - □ Medicines and other substances used to treat human illness, disease, or discomfort
 - □ Illicit drug substances that are used to manipulate the human brain's natural processes
 - □ Food and nutrients important for providing energy and molecules the human body needs for health and survival
- <u>Category B:</u> Materials for building new technologies and providing energy
 - □ Metals and *alloys* useful for building *microprocessors*, *superconductors*, and other electronics and hardware parts
 - □ Silicon- and carbon-based materials (such as graphene) that can be used in new ways to build onto existing technologies, allowing for innovative uses and abilities
 - Hydrocarbon fuel sources, how to more efficiently use their energy, how to control the negative environmental, social, and economic impacts of their usage, and how to use new technologies to reduce human dependence on fossil fuels and harness innovative, sustainable energy sources instead
- <u>Category C:</u> Complex, large-molecule *polymers* and unique versions of elements with useful properties
 - Man-made fabrics, such as nylon, polyester, rayon, spandex, and others, can be used to create more comfortable, useful, and safe clothing options
 - □ Plastics have been used over the last 50 years more and more commonly to make human's daily lives easier and more affordable, but they have also created a global waste problem.
 - □ Glass and other man-made materials that are made from minerals naturally found on earth have drastically changed the kinds of building materials and products humans rely on
 - □ Allotropes are different forms of elements that are stable enough to exist naturally, such as *graphite* and diamond both natural versions of carbon or *ozone* and *diatomic* elemental oxygen

(The descriptions above are not completely inclusive. There are many other examples of man-made materials from these three categories and others. If you have a particular interest that you have trouble connecting to one of these topics, talk with your teacher for extra guidance, suggested resources, or clarification about whether or not your idea is appropriate for our study of chemical bonding.)

Develop a meaningful research question; this is the question your final product should seek to answer:

The best research questions *can't* be answered with a simple "yes" or "no." Good, worthwhile questions are complicated, and they require deeper critical thinking in order to find a meaningful answer. You'll need to get information from a variety of high quality sources and pull all of those ideas together to find a reasonable answer to your question.

3. What topic do you want to specifically focus on? Why do you think this is a worthwhile topic?

- 4. What question(s) could you ask that connect your topic and chemical bonding?
- 5. What will your final research question be? (Get this question approved by your teacher before you actually start on the research process and planning your final product for this assessment.)

Consider what kinds of resources will be most helpful in finding the answer to your research question:

- 6. How will you know if these sources are reliable or not?
- 7. How will you keep track of your sources and refer to them in your final product?
- 8. What is the best way for you to connect your final product directly to these sources of the information you use along the way?
- 9. In the space below, keep a list of the sources* you are using and how you know they are high quality, reliable sources of information for your research:

What source are you using?	Why was this source useful? What important idea did you learn?	How do you know this is a high quality, reliable source of information for your topic?

*Just because there are only a few rows above doesn't mean you should only use a few sources! Add more to your list of sources by attaching another piece of paper and keep track of all your sources and how you know they are valuable and reliable.

Decide which kind of final product will best help you effectively communicate what you've learned:

10. Choose one of the options below for your visual product:

- Design and publish a digitally-created visual graphic such as an infographic, a digital poster, an interactive webpage, a digital 3D model, or a video that explores a specific man-made molecule of your choice and its structure. Your digital graphic must show thoughtful consideration of design, communication, and viewer-friendliness and should strategically utilize the benefits of the digital format you chose. There must be strong use of valuable scientific and statistical data (with correct citations) that is communicated in an intriguing and thought-provoking format.
- Build an interactive, physical 3D model of a specific man-made molecule of your choice and annotate it with explanation of how its structure explains its properties. Your model must be unique in presentation and material, and it must be thoroughly annotated with explanations of its chemistry (including its molecular geometry, polarity, and impact). Your physical model must include strong evidence of research (with correct citations) as well as thoughtful consideration of design, communication, and viewer-friendliness.

Your final product is due on ______.