

GNG1103
Engineering Design

Deliverable F

Date: March 1,2020

Team #: F08

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1. Reasons for Prototyping and Testing

1. Make a plan for the final Prototype for Design Day
2. Get a deeper understanding of what we are going to create
3. Reduce the risk of errors
4. Verify that it is feasible
5. Find mistakes in advance , improve them and incorporate any feedback.

Prototyping is important in order to save time, money and energy. Prototyping will help us determine if the design concept will work as it is meant to to work and allow us to see how we can improve the design concept to allow for the user to have a better experience and satisfy the customer needs. For Prototype 1 the team decided to model three molecules in unity and show how the molecules rotate and vibrate. The first molecule is a space filling representation, the second model is a ball and stick and the last model is one that shows the orbitals. We were able to create the prototype by using solid works and unity. This allowed us to experiment with the best way to represent some of the complex forms required. Additionally, it allowed us to experiment with the proportions to create a clear and aesthetically pleasing model. The biggest challenge was correctly representing the different angles in three dimensions and this was largely accomplished by making small, appropriately oriented flat faces to allow the parts to be mated accurately. The geometry and proportions of the space-filling model was deceptively complex and necessitated research to determine the appropriate radii. We will be testing the prototype for several reasons. First, to learn more about the design concept and reduce any risks and contingencies like the orbitals not rotating properly. Testing the prototype is important in order to compare how it will work to our ideal standard. The specific test objective of prototype 1 is to show how the molecules vibrate and rotate and how they look in different representations. Feedback will help us improve prototype 1. The prototype looks like a successful prototype as it resembles our design concept and it is aesthetically pleasing. We tested the prototype in front of two students and asked for their feedback. We made an analytical simulation. Our first prototype was focused and analytical though the final prototype will be comprehensive. The fidelity of our prototype is high as it represents the molecules nearly as they will be in the final in spite of the narrow focus.

2. Testing Plan

The first prototype does not resemble our last prototype. There is still a lot of work that we must accomplish to finish our final product. But from the test that we ran in unity we saw that the models do vibrate and rotate. Stopping criteria is simple once we created a good prototype and have both positive and negative feedback will stop testing the prototype.

3. Cost of Prototype

We have a budget of \$100. So far we have not spent any money in the unity store but we might buy something from the store for prototype II.

4. Feedback

In our skype meeting with the client they saw the first model of the prototype- the ball and stick- and liked it but they said for the final product they would like us to show an acid base reaction that happens in solution.

We showed two first year students our prototype 1 both currently enrolled in organic 1. They had a hard time visualizing both the orbital molecule and the space filling molecule. They said that it would be easier to visualize the pi and sigma orbitals if they were coloured. They were also not able to recognize the molecule when it was in the orbital or space filling form though this could also be because their knowledge of nomenclature was lacking.

5. Prototype 1

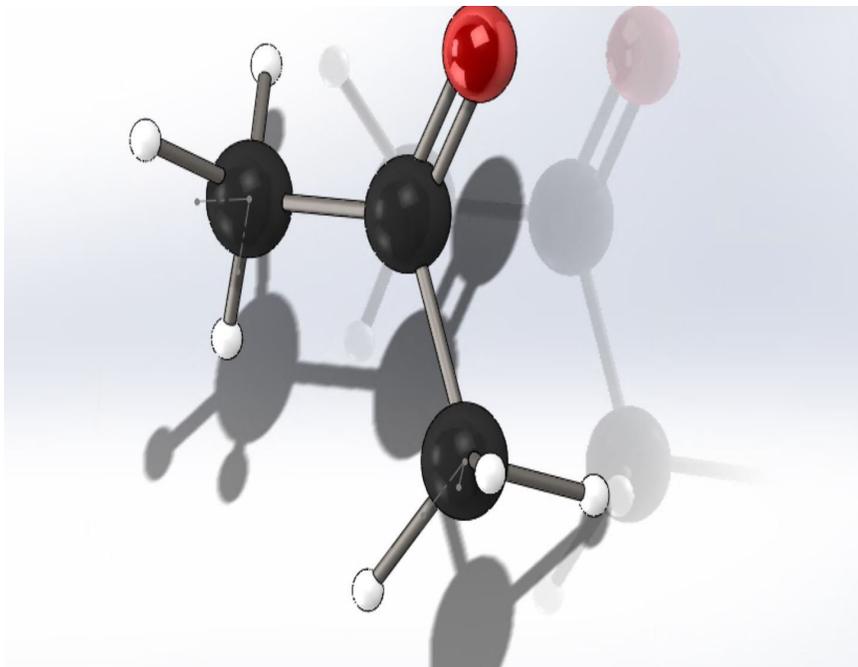


Figure 1. Prototype 1 Ball and stick Acetone molecule

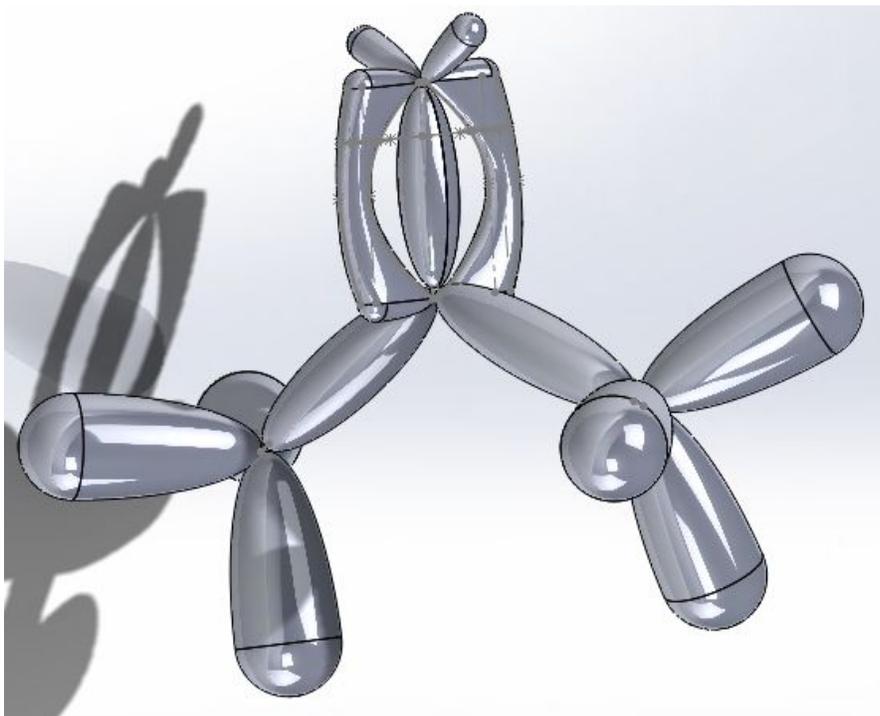


Figure 2. Prototype 1 Orbitals Acetone Molecule

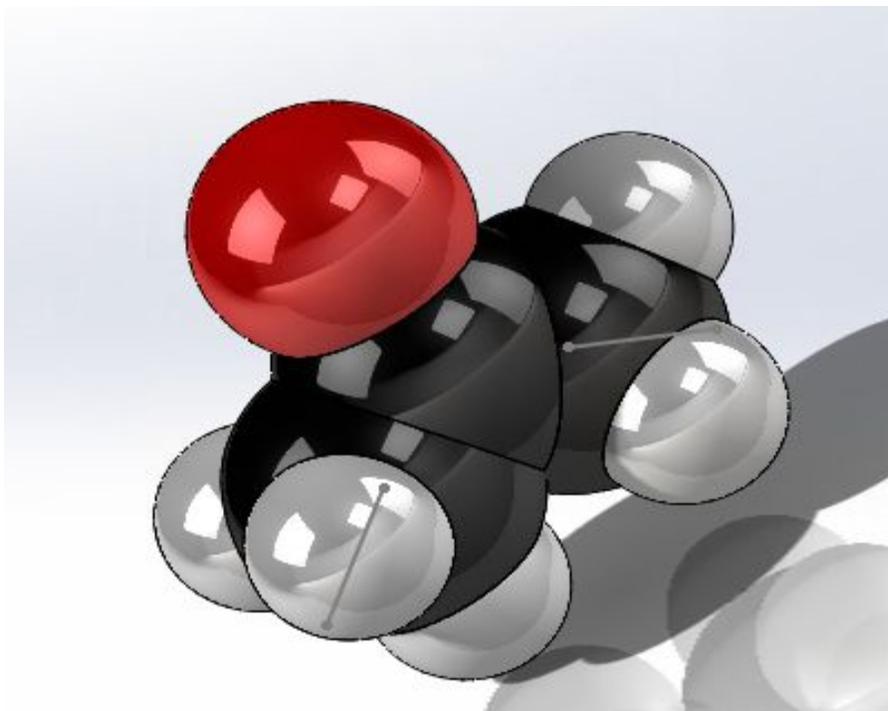


Figure 3. Prototype 1 Space filling Acetone Molecule

Conclusion

Right now the design is pretty simple. We still need to work on the interactive side of the molecules and the acid base reactions. The design can be seen in unity and we are able to show how the molecules rotate and vibrate. Some improvements can still be made but overall our prototype fidelity is high and we are happy with what we have accomplished till now.