

Name: _____ **Date:** _____ **Class:** _____

Engineering Design Notebook

You will watch videos throughout this project about aerogels. You are to record answers as you hear them. You will have to watch multiple videos to get all the answers.

1. Define/describe an aerogel
2. What are some chemical, physical, mechanical, etc. properties of aerogels?
3. What are the uses of aerogels?
4. From what are aerogels made?
5. What is compressive strength? What is a substance that has high compressive strength? Low compressive strength?
6. What does compressive strength have to do with aerogels?
7. What is an emulsion? What is a common everyday emulsion?
8. What is an emulsifying agent?
9. What do emulsions have to do with aerogels?

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The Situation

When you shake a bottle of oil and vinegar salad dressing and look at it (before the layers separate), you are looking at an emulsion. An *emulsion* is a heterogeneous mixture of two or more *immiscible* substances dispersed in each other. Often, a chemical called an emulsifying agent is added to prevent the layers from separating back.

Engineers might research aerogels to create coatings for clothing or masks which can filter out contaminants and thus improve our health. It is also being done create better matrices for cells to grow on to fight disease, aid injuries, etc.

This research involves the creation of an aerogel by first creating a gel polymer emulsion. Unfortunately, the emulsifying agent and dissolved liquid cannot simply be evaporated because the holes left behind in the gel will collapse. Thus, a multistep solution exchange process is performed to get rid of them and leave the holes left behind intact. This involves the sample being soaked in a solution for 24 hours, put into a (different) solution for 24 hours, and then a third liquid for 24 hours before the sample is soaked and dried with supercritical liquid carbon dioxide. The result is a solid with lots and lots of pores (holes) in it called an aerogel.

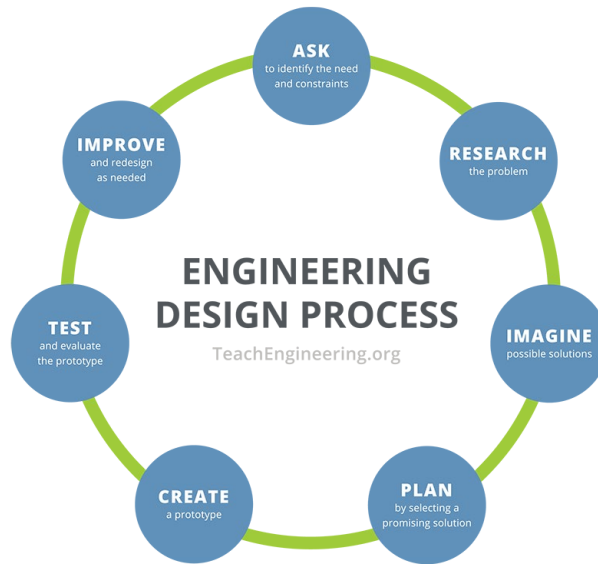
Due to their unique structure, aerogels have many properties that make them very useful. However, aerogels are not widely used because it is still expensive to make them.

Today, you are a materials engineer. Your job is to start with a mixture and come up with a means of eliminating part of the mixture without destroying the holes left behind. Your sample "gel" is chocolate chip cookie dough.

Design Challenge: Find a means for removing chips from chocolate chip cookie dough and leave the holes left behind intact.

Design Constraints. Record the design constraints your class decided upon below.

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Imagine/Brainstorm. Draw, Sketch, or Write. . .

Spend time thinking how you will solve your challenge. When everyone in the class has completed the first box, you will meet with your group members, and brainstorm together.

My Ideas	My Partners' Ideas
Our Groups Decision: Explain	

Name: _____ Date: _____ Class: _____

Project Planning Log

Discuss the questions with your group members and answer questions. Each person in the group must complete their own log.

1. What is the time period for this log (2 days, 1 week, etc.)? _____
2. What are your group's goals (task to be completed) for this time period?
3. What task(s) will you complete?
4. What other tasks must be completed? Record the name of the person completing each task.
5. What percent of the work will you complete? ____
6. What percent of the work will each other person complete?
7. If someone is absent and has the group flashdrive or other important paper/file causing the rest of the group members to not be able to get work done on that day. What will you plan be to make up for time?
8. If you end up being absent during this project, what will you do so that you don't lose points and cause your group to fall behind and risk losing points?
9. List the names of your group members and their plan for making up work if they are absent at any time throughout the session.
10. If someone in the group is absent and doesn't make up the work, what will your group do?

Name: _____ **Date:** _____ **Class:** _____

Reflection. Complete this at the end of the given time frame.

11. What percent of the group’s work did you complete? What tasks did you complete?

12. What other tasks were completed? Record the name of the person completing each task. Estimate the percentage of work completed by each person.

13. Was anyone absent? Did they complete the work they were supposed to complete? Explain.

14. What letter grade would you give each person? **Provide comments.**

15. Were any tasks not completed? _____ If so, complete the chart below.

Task Not Completed	Person Responsible	Reason Why	Adjustment that must now be made

16. What are the group’s goals for tomorrow?

Name: _____ **Date:** _____ **Class:** _____

Lab Notes:

Use the space below for data tables, observations, sketches, or other important information as you work through your challenge.

Name: _____ Date: _____ Class: _____

Mini Presentation Rubric

Presenters: _____

<p>Logistics</p> <ul style="list-style-type: none"> <input type="checkbox"/> Was a cover page included with an appropriate title, the team name, (first and last) student names, and date arranged nicely? <input type="checkbox"/> Was an ending slide included ('Thank you for listening!'; Conclusion; etc.)? <input type="checkbox"/> Did EACH speaker speak loudly enough the entire time? <input type="checkbox"/> Did EACH speak at a good pace—not too fast/slow? <input type="checkbox"/> Did EACH face the audience and maintain eye contact or did they simply read from their visual aids (Prezi, PowerPoint slides, etc.)? <input type="checkbox"/> Was a cover page with an appropriate title, the team name, student names, and date arranged nicely? <input type="checkbox"/> Were terms pronounced correctly? Was proper grammar used? <input type="checkbox"/> In the visual aids, were all words spelled correctly? Was proper capitalization shown? Proper spacing shown? Was the text large enough? <u>Does every slide have a title showing appropriate capitalization?</u> <input type="checkbox"/> Were main ideas—not details and lots of writing—written on the slides? <input type="checkbox"/> Did the pictures help express the ideas? Were they arranged nicely? <input type="checkbox"/> Does it look nice overall? 	<p>5 · 4 · 3 · 2 · 1 · 0</p>
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Name: _____ **Date:** _____ **Class:** _____

<p>Content</p> <ul style="list-style-type: none"> <input type="checkbox"/> Was a slide mentioning basic aspects of aerogels included? <input type="checkbox"/> Was the engineering design process included on one or more slides? <input type="checkbox"/> Was the design challenge included on a slide? <input type="checkbox"/> Was how the challenge relates to aerogels included on a slide? <input type="checkbox"/> Were the design constraints included on a slide? <input type="checkbox"/> Were two brainstormed ideas mentioned? <input type="checkbox"/> Were we told why they chose the strategy they chose or why they rejected those that were rejected? <input type="checkbox"/> If the project didn't work, were we given ideas as to why or about other strategies they will try and why? <input type="checkbox"/> Was a slide mentioning the 21st century skills included? <input type="checkbox"/> Was a situation showing growth in the 21st century skills (critical thinking, collaboration, creativity, communication, conflict resolution, perseverance) on a slide and CLEARLY explained? <input type="checkbox"/> Was the presentation thorough? Did it follow a logical progression? Were supportive pictures provided? Did it make sense? <input type="checkbox"/> Did they answer questions well, if asked? 	<p>5 · 4 · 3 · 2 · 1 · 0</p>
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<p>Teamwork</p> <ul style="list-style-type: none"> <input type="checkbox"/> Did it seem like EVERYONE contributed to the preparatory work? (Did each person know the information or did it seem like only one or two people understood it?) <input type="checkbox"/> Was the presentation shared equally? (Did one or two persons dominate the presentation or did everyone speak the same amount?) 	<p>5 · 4 · 3 · 2 · 1 · 0</p>
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Name: _____ Date: _____ Class: _____

Comments (Restrict comments to the presentation and not the presenter(s). Provide only helpful comments. You **must** provide comments if you assign a less than perfect grade.)

Overall, how would you rate the presentation?

5 · 4 · 3 · 2 · 1 · 0

Name: _____ Date: _____ Class: _____

Peer Feedback 'Post-It' (Gallery Walk) Activity

When instructed, review your sticky notes as a team, split them up, and place them in the appropriate boxes below to help you with your redesign.

One great aspect of this project:

One thing to consider/Area of Growth/Idea to Try:

Teacher Initials: _____

Name: _____ Date: _____ Class: _____

Redesign Constraints

Record the design constraints your class decided upon below.

Imagine/Brainstorm (Redesign)

Record/Draw your/ your group's new idea.

New Ideas

Name: _____ Date: _____ Class: _____

Project Planning Log (Redesign)

Discuss the questions with your group members, answer questions #1-10 and have initialed. Each person in the group must complete their own log.

1. What is the time period for this log (2 days, 1 week, etc.)? _____
2. What are your group's goals (task to be completed) for this time period?
3. What task(s) will you complete?
4. What other tasks must be completed? Record the name of the person completing each task.
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14. What letter grade would you give each person? **Provide comments.**

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Name: _____ **Date:** _____ **Class:** _____

Redesign Lab Notes:

Use the space below for data tables, observations, sketches, or other important information as you work through your challenge.

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Final Presentation and LinkedIn Page

Presenters: _____

<p>Logistics</p> <ul style="list-style-type: none"> <input type="checkbox"/> Were appropriate cover page & final pages included (See Mini Presentation)? <input type="checkbox"/> Did EACH speaker speak loudly enough the entire time? <input type="checkbox"/> Did EACH speak at a good pace—not too fast/slow? <input type="checkbox"/> Did EACH face the audience and maintain eye contact or did they simply read from their visual aids (Prezi, Powerpoint slides, etc.)? <input type="checkbox"/> Were terms pronounced correctly? Was proper grammar used? <input type="checkbox"/> In the visual aids, were all words spelled correctly? Was proper capitalization shown? Proper spacing shown? Was text large enough? Does every slide have a title showing appropriate capitalization? <input type="checkbox"/> Were main ideas—not details & lots of writing—written on the slides? <input type="checkbox"/> Did the pictures/videos help express the ideas? Were they arranged nicely? <input type="checkbox"/> Does it look nice overall? 	<p>5 · 4 · 3 · 2 · 1 · 0</p>
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Name: _____ Date: _____ Class: _____

<p>Content</p> <ul style="list-style-type: none"> <input type="checkbox"/> Was a slide mentioning five basic aspects of aerogels included in after the cover page? <input type="checkbox"/> Next, was the engineering design process included on a slide? <input type="checkbox"/> Next, was the design challenge included on a slide? <input type="checkbox"/> Next, was how the challenge relates to aerogels included? <input type="checkbox"/> Next, were the original design constraints included on a slide? <input type="checkbox"/> Was the info from the Mini Presentation found on the slides in the middle? <input type="checkbox"/> Next, were the new design constraints included on a slide? <input type="checkbox"/> Next, was the new/altered idea mentioned? <input type="checkbox"/> Were we told why they chose that idea? <input type="checkbox"/> If the project didn't work, were we given ideas as to why or about other strategies they would try and why? <input type="checkbox"/> Was a slide identifying the 21st century skills (critical thinking, collaboration, creativity, communication, conflict resolution, perseverance) included? <input type="checkbox"/> Were two situations showing growth in the 21st century skills on a slide and CLEARLY explained? <input type="checkbox"/> Was the presentation thorough? Did it follow a logical progression? Were supportive pictures/video provided? (Did it make sense?) <input type="checkbox"/> Did they answer questions well, (if asked)? 	5 · 4 · 3 · 2 · 1 · 0
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Overall, how would you rate the presentation?	5 · 4 · 3 · 2 · 1 · 0
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Self, Peer, and Group Evaluation

Answer.

1. What tasks on this project were completed by you? What percentage of the work did you complete?
2. Were you absent during any part of the project? If so, did you still complete your share of the work? **Explain.**
3. How would you grade yourself on this assignment? A · B · C · D · F

Provide comments.

4. Record the names of your group members and the tasks that each of them completed. What percentage of the work did each person complete?
5. Was anyone absent during the project? If so, did each still complete his/her share of the work? Explain.
6. How would you grade your group members on this assignment? **Provide comments.**

Name _____ A · B · C · D · F

Name _____ A · B · C · D · F

Name _____ A · B · C · D · F

Comments:

7. How would you grade your group on the following? **Provide comments.**

Producing a product A · B · C · D · F

Getting along/resolving conflict A · B · C · D · F

Sharing responsibilities equally A · B · C · D · F

Helping each other A · B · C · D · F

Name: _____ **Date:** _____ **Class:** _____

Comments:

8. Is there anything else you would like your instructor/coach to know?